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QUARTERLY

THE CHICAGO MEDICAL SCHOOL

VOLUME 4, NUMBER 3

DECEMBER, 1943

BUY WAR BONDS

QUARTERLY

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THE CHICAGO MEDICAL SCHOOL

VOLUME 4, NUMBER 3 **DECEMBER, 1943**

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Editorials . . .

STUDENT COUNCIL VERSUS STUDENT APATHY—

IN A PAST issue of the *Quarterly,* the formation of a Student Council was advocated in these columns. Apparently, the importance of such an organization in the structure of the School was not sufficiently stressed, or, if it was, a lack of initiative and interest on the part of the student body made such emphasis useless. For there is still no representative student organization in the School, nor has any positive action been taken to form one. This reaction—or, rather, lack of reaction—is both puzzling and unfortunate.

A Student Council would be more than an empty title. It would be a means of co-ordinating the activities, and pooling the energies, of the several organizations in the School and the student body as a whole. It would be an organ of articulation, an instrument of action, and a body that would truly represent the students in their relations with the administration. Since we have heard no valid objections to the Council, the potential value of such a group makes further inaction inexcusable.

We suggest that the officers of the several classes and of the organizations in the School take the initiative by forming a temporary body to decide upon the general organization of, and means of electing, a Student Council. Class officers, as elected and responsible representatives of their fellow students, should not only serve in this capacity, but should automatically become members of the Student Council to be formed. Their present duties are so insignificant that even the honorary nature of their offices is fading. Their participation in Council activities would be natural and desirable.

Our school is continually taking steps toward the improvement of its facilities, curriculum, and personnel. Let the student body demonstrate that it intends to remain abreast of this progress, and do its part in promoting it, by forming a representative and responsible Student Council.

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TRENDS IN MEDICAL EDUCATION . . .

MEDICAL educators, in the near future, will be required to make some important decisions regarding changes in medical curricula and the direction such changes will take. The war has postponed these changes, to a certain extent, but eventually may prove to be one of the chief factors necessitating them.

The study of medicine has become progressively more complex and extensive through the years since Osler set the rule that all doctors should spend several years in general practice. Some men believe that the day of the general practitioner has passed; that only the specialist has sufficient knowledge and experience to give the patient the full value of his highly advanced and ever-changing field of medicine. Others feel that the specialist's field of vision tends to become narrowed, and that he looks upon a patient as a heart, or a kidney, or a stomach (depending upon his specialty) with various other unimportant structures attached. There are men who feel that specialization is so important that it should be started in medical school, with the student "majoring" in his chosen field. While there are many arguments against such a change, one fact must be recognized. The amount of knowledge a medical student must absorb to-day is much greater than that expected of the student of several decades ago, and this mass of knowledge is growing larger every year as new fields develop.

Industrial medicine, for example, has assumed great importance in recent years, especially with the expansion of war industries. This field of medicine requires special training, which some authorities claim the schools have not been furnishing adequately. Similarly, public health and preventive medicine is a highly important and specialized field which is not adequately covered in present curricula. After the war, training in such matters will be badly needed in the rehabilitation of war-devastated countries. The incidence of tropical diseases is expected to rise markedly in the coming years, and future doctors must be prepared to recognize and treat them. Medical psychology and psychiatry are also becoming more important and useful.

How can the schools give the young doctor enough training to cope with these many new types of medicine, when the teaching to which he is now exposed is already so tremendously concentrated and extensive? We see only two answers to this question. The first solution is the extension of the medical curriculum to five academic years, with the inclusion of additional or more extensive courses. This will be necessary if the object of medical education remains the production of well-rounded potential general practitioners. If the present trend toward specialization persists, however, the alternative remedy is more reasonable—the emphasis in medical school of the field chosen by the student, with the elimination of numerous unrelated subjects. The student could base his choice upon a series of brief, superficial, introductory courses in the various fields which would be at least as sensible as the haphazard factors that influence physicians in their choice of specialties at present.

Which of these directions will be taken depends largely upon the future trends in medical practice. Medical education must not remain static, but must keep step with the changed conditions that are met with in practice. Our school recognizes this fact, and, as a result, courses in public health, parasitology, tropical medicine, medical psychology and psychiatry have been either introduced into the curriculum or greatly enlarged. The urgent need of doctors for the armed forces, and the resultant acceleration program, must precede all other considerations for the present, however, and progress in medical education is thus necessarily restricted until the end of this emergency. Nevertheless, it is gratifying to observe that the administration is sharply alert to current and future trends in medicine, and is prompt in providing appropriate training.

ON TROPICS AND DOCTORS

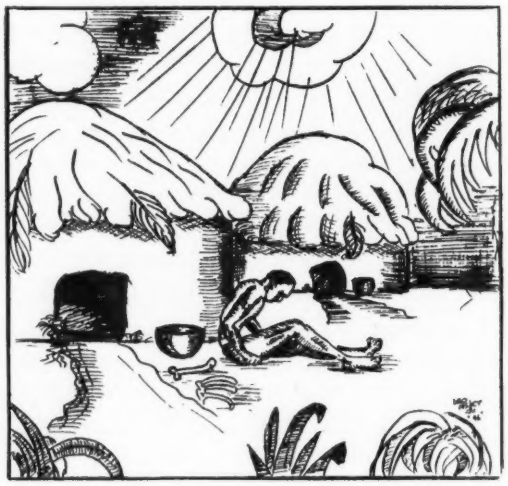
OSCAR FELSENFELD, M.D.
Assistant Professor of Bacteriology and Parasitology, The Chicago Medical School

THE moon's ghostly smile blinking through the silver clouds . . . Sweet ukulele and mysterious tom-tom sounding into the love-filled air . . . Gorgeous bayaderes and swift-bodied odalisks swinging in the sensual half-dim . . . That is the tropical night a la M-G-M movies, as dreamed of by artists, idealists, kitchen-maids, highschool girls and other impractical people.

Unwashed fruits laden with germs . . . Moist air humming with mosquitoes . . . No canalization, no sewage disposal, and no proper delousing . . . That is the tropical day for physicians, engineers, soldiers, and other useful men.

The peculiar thrill the tropics affords a permanent settler lies in the perfect disillusion one reaches there. With the exception of big cities, life nowhere fulfills the great expectation that everybody harbors in his heart when he goes to a warm country. I have talked with scores of physicians, bacteriologists, nurses, businessmen, and missionaries from the most distant corners of the tropics, and each of them revealed the secret that the things they observed quite deprived them of the ideals with which they arrived.

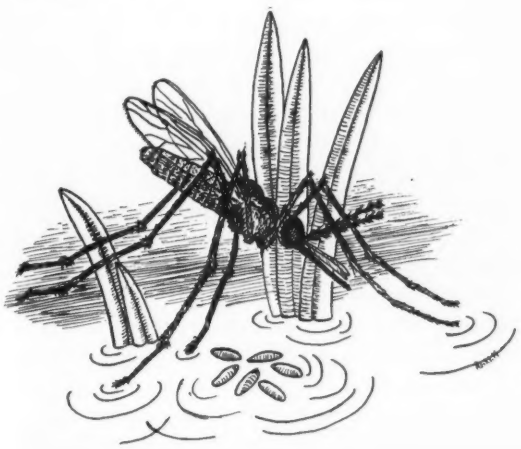
The physician found himself confronted with a super-absolute lack of interest in hygiene by the native. The nurse complained that there was no willingness to follow her advice. The bacteriologist experienced no appreciation of the findings that he had literally "sweated out" under incredible working conditions. The businessman could not sell much to the native who has simply no money—the "no" meaning here the absolute "no-est no" as it was used by the old Greeks. The missionary found himself a stranger, living and eating better than any native in a small community with many internal difficulties in the ocean of pagans; fighting superstition, but so successfully that nowadays nobody can differentiate as to whether a folk-tale told in the Congoes is original, or has admixtures of Christian descendency; putting the natives in Western garments and superimposing Western culture and customs, because in his mind, they are indivisible from Christianity. Sometimes you find the native more westernized than Christianized as a result of such activity. Look at the map and imagine a meeting of two Chinese, one from Peiping and the other from Shanghai. The man from Peiping says: "I am a Southern Methodist" and the convert from Shanghai proudly reveals: "I am a Northern Methodist."



It is, however, unquestionable that besides such unhappy outgrowths of "Westernism" the churches have done more than many of the governments for the public health in tropical countries. In evaluating this great job, we have to keep in mind that the churches have a great handicap when compared with the colonial offices. They can select physicians, nurses and agricultural workers only from the relatively narrow group of their devoted believers. Sometimes it happens that the medical missionary is better prepared as a preacher of the Gospel than as a health worker. At present, most churches carefully select their physicians and nurses. The sanitary engineer on mission field is usually the agricultural missionary. It is my firm conviction that the sanitary engineer is the most essential worker of the medical group. The physician is too busy with the treatment of the sick individual. The nurse performs much educational work. But the agricultural missionary digs the latrines and teaches the natives to use them. He also fights mosquitoes and tries to provide better food and housing for the growing Christian community. With regard to the little interest of many churches in the social-economic life of the converts, and the small financial support for such uplift, the agriculturists perform a fine job, especially in China and in the Congoes.

Most of the medical work is done by colonial governmental agencies. In the Belgian Congo, every church has its own county in which to work, and the government (the most liberal and most careful of all colonial governments) maintains a network of state health agencies. The British, on the other hand, believe in an indirect rule. They deal with the natives, not directly, but through the paramount chiefs. They have an excellent health service, but differ from the church medical work in that they stop when a native religious custom stands in the way of public health measures. Two examples might be given. Per-oral vaccination was stopped and much material spoiled because the Hindus rejected the use of enteric vaccines containing bile. Schistosomiasis is propagated by Mohammedans urinating in flowing water in order to satisfy the requirement of cleansing after urination imposed upon them by the Koran. They thus deposit the eggs directly into the mouth of the waiting snails. A British health officer will do everything against the spread of the disease short of telling the believer of Allah that Mohammed was wrong. The British also made admirable progress in the Indies in the field of laboratory research work. His Majesty's Indian Health Service, moreover, does not discriminate against the pariah as even Gandhi does.

The most progressive public health work in the tropics is performed by the Dutch. It was mainly Java where much research work was done and where the best physicians for tropical work were educated. Under present war conditions, we miss most of the Dutch contributions to science, but I am sure that after the war, this work will be resumed at its former high level.



One cannot say as much for the Portuguese and Spanish colonial health activities. The medical work in the African colonies of Portugal was mostly in the hands of missionaries, the government being very negligent in its duties.

It is difficult to write about France. The French colonies presented a peculiar picture. Frenchmen do not have the Anglo-Saxon attitude towards "colored races," and officials mingled with natives, mainly with the Arabs. There were many mixed marriages. The indigenous student from a French colony had the opportunity to receive the same education as did his white colleagues. The Sorbonne in Paris was full of natives of Senegal, North Africa and Indo-China, who returned to their homes as State officials. On the other hand, forced labor flourished in many French colonies, and the administration was often backward. Public Health matters were treated with a certain nonchalant easiness, complications with the natives being avoided and individual care of the sick serving as a basis. An excellent net of diagnostic laboratories was maintained, some of which (e.g. Institute Pastéur de Tunis) had a worldwide reputation. Americans gave a helping hand in Syria with the establishment of the American University of Beyrouth.

The Ibero-American countries have highly developed health organizations—mainly the A-B-C countries and Mexico. Public Health work, however, reaches the jungles and their inhabitants slowly. Anyone who underestimates the South American physicians commits a grave error. Their medical schools are on a high level, and there are many outstanding scientists in these countries. A great setback for present development are the unfavorable political and economic conditions in some parts of South America, as well as the deeply-rooted superstitions of the poor classes.

There are not too many free spots left on the map. China, the greatest free "colored" country, depended on Western churches for most of her health program. The Japanese used to do much studying, had many workers educated in Western countries, but were addicts of the German philosophy of medicine: "Make a brilliant diagnosis, that's all." There was no noticeable public health work in Afghanistan or Ethiopia.

It is practically impossible to give more than short, but meaningless, statements within the limits of this

(Continued on page 26)

MIGRAINE

MAX DEE SHAPIRO

ALTHOUGH the term "migraine" is of comparatively recent origin, the clinical entity that the term portrays may be found in some of the earliest of our scientific literature. In the writings of Aretaeus (90-30 B. C.) is found a reference to a species of head pain, unilateral in limitation, paroxysmal in character and associated with nausea and emesis. This may be considered as the first definite description of migraine, as we know it today. Aretaeus referred to this condition as "Heterocrania" and it was not until about half a century later that Galen (137-201 B. C.) adopted the term "hemicrania" which, during the course of time, and much translation, finally evolved in English medical literature as "migraine" (1777).

As might have been expected, much has been done—and written—on the subject of migraine. In the course of these investigations there have been described various forms of migraine, e. g. allergic migraine, status migrainosus, menstrual migraine, menopausal migraine, infantile migraine, abdominal migraine, ophthalmoplegic migraine, and migraine associated with changes of temperature and weather. Each of these various forms of migraine have had their special proponents and investigators, but from this rather imposing list of various "forms" one might be almost tempted to doubt the existence of migraine as a clinical entity, and rather think of it as a syndrome, to be found associated with a number of diseases.

The etiology, pathogenesis, and pathology of migraine has been a subject of discussion and investigation since the time of Galen, and it is Galen who is credited with being the first to propose a theory as to the pathogenesis of what he termed "hemicrania." In his time, humoral pathology was the prevalent notion. Therefore, in keeping with this notion, he proposed the theory that noxious "vapores" and "humores" formed in various parts of the body and circulated toward the brain, and these were responsible for the outbreak of the migrainous seizures. Similar interpretations were maintained by his successors and the writers of the middle ages.

In reading the history of migraine, it is certainly not uncommon to find that many of the investigators and authors were themselves victims of the disease. Such a one, for example, was Piso (1618) who, in his autobiography, gave a detailed account of his attacks, pointing out that seizures could be brought about by change of weather and wind. This was a new and remarkable contribution to the problem of migraine. But it is Tissot (1873) who is regarded by many authors as being the first to have advanced a plausible theory for the etiology of migraine. It was his belief that gastro-intestinal disturbances in some manner affected the trigeminal nerves and thus gave rise to cepholgia. He pointed out that indigestion and dyspepsia were etiological factors and emphasized the importance of giving proper treatment to the primary gastro-intestinal manifestations.

To-day the concept of a vasomotor genesis of migraine has been most universally accepted. This concept was first advanced by DuBois-Reymond who, incidentally, was himself a sufferer from migraine. It has been shown, by Graham, Sutherland, and Wolff, that the migraine seizures are due to a hypotonicity of certain cranial arteries. Clark, Hough, and Wolff believe that the increased amplitude of the arterial vessels, due to their hypotonicity, stimulates the periarterial nerve plexus. This stimulation is then transmitted centrally via the trigeminal nerve and other, as yet undetermined, pathways and is interpreted as pain.

Goltman observed a migrainous patient through a trephined area and his interpretations were that there is an initial vasomotor spasm, with a blanching of the face. It is during this initial stage that the so-called "aura" occurs with numbness, tinglings and ocular symptoms. This vascular spasm is believed to cause an ischemia of the brain, or parts of the brain. This is then followed by a secondary stage of vascular dilatation which results in the aforementioned state of hypotonicity with consequent cerebral edema and a temporary disproportion between the size of the cranial cavity and its contents.

In an effort to prove that the pathology of migraine was vasodilatation and a distention of cranial arteries, Sutherland and Wolff have conducted a series of experiments to demonstrate the effect of various agents on a migraine attack. In the course of these experiments these investigators made recordings of the pulsations of the cranial arteries, chiefly certain branches of the external carotid artery, and they have

shown that the most effective therapeutic agent in migraine was ergotamine tartrate; in most cases, the headache was abolished and concurrently the amplitude of the cranial artery pulsations decreased. Conversely, the administration of vasodilators, such as amyl nitrite and histamine phosphate, resulted in an increased amplitude of pulsations of the cranial arteries, with an increased severity of the headache.

Since the writer is himself a sufferer from migraine he would like to take this opportunity to set down some personal observations of the symptomatology and possible etiological factors of migraine and attempt to correlate these observations with the findings and observations of some of the investigators in this field.

It has been the writer's experience that there is apparently more than one precipitating, or etiological factor associated with the onset of a migraine attack. For example, it has been known to the writer, from bitter past experiences, that the ingestion of a harmless-looking banana would inevitably result in a migraine seizure. Such an observation would perhaps be in line with an "allegric migraine" as demonstrated by Vaughan. This investigator, in 1927, first demonstrated conclusively an allergic etiology for migraine by the finding of positive skin reactions in a series of migraine patients. He further proved his point by obtaining a relief of symptoms following avoidance of foods that gave positive skin reactions and subsequently inducing a migraine attack by feeding these patients these same foods.

It has also been noted by the writer that the anticipation of some comparatively great event—for example, in childhood, the anticipation of attending a football game on the following day—almost always was sufficient to usher in the "great day" with a rather severe migraine attack. On this point it is interesting to note that some few years ago a theory was propounded as to the etiology of migraine which might serve to explain this aforementioned observation. Briefly, this theory postulated that a migraine seizure might be due to an excessive amount of "unused" adrenalin being present in the blood stream. It was claimed that these subjects become excited in anticipation of some great effort that is to be expended in the near future—this resulting in an excessive production of adrenalin, as a response to this excitement. Then, for some reason, the anticipated expenditure of energy either does not occur at all, or later than expected, thus leaving the individual with this so-called "unused excess" of adrenalin. This, in predisposed subjects, may act as the etiological or precipitating factor in causing a migraine attack. To the best of the writer's knowledge this was only a theory put forth with no experimental work to bear it out so that we must, of necessity, bear a reserved attitude toward it. However, it is the only theory in the literatures that could be found to bear out and possibly explain the writer's observation. For that reason alone it is being mentioned in this discussion.

There has been one other interesting observation made which has led the writer onto the path of theorization. This observation is simply that hunger, if not appeased, will without fail lead to a severe migraine attack. And, along this same line of thought, it has also been noted that very often the writer would waken in the morning with a very severe headache, especially so if he had had an early and not-too-heavy meal on the previous evening. This has resulted in the aforementioned theorizing as to the possible relationship of a hypoglycemia with a migraine seizure. Coincidentally the writer found it necessary to stop using sugar in his meals, substituting saccharin instead. After using the saccharin for two or three days a migraine attack developed on rising in the morning, and lasted for 3 to 4 days. On the suspicion that the absence of sugar in the diet may have been related to the attack, he (the writer) stopped using the saccharin and once more resorted to sugar in his diet. The attack slowly subsided. On another subsequent occasion he once more started to use saccharin and after using no sugar for about 36 hours found that a migraine attack was approaching. Interestingly enough the ingestion of three or four pieces of sweet milk chocolate candy seemed to be sufficient to abort the impending attack. This point is made here simply to call attention to the possibility of a relationship between the blood sugar level and a migraine attack. It should prove interesting to investigate such a possible relationship.

It has been known for a long time that a migraine attack, as in a true epilepsy, is preceded by a so-called "aura." To this the writer can attest. From his own experiences he would say that an attack is preceded by a sense of fullness in the head, pain in the eyes which may be uni- or bilateral, a sense of impending pain, and a general feeling of tightness in the epigastrium. The best description for this latter symptom is that the stomach feels as if it is tightened up into a ball with a general feeling of discomfort in the abdomen. Then, as the attack

sets in the face gets very hot and flushed, the pain, almost always unilateral, and in the writer's case, occipital, will usually start slowly to build up to a peak. The pain itself is of a throbbing or a pulsating nature. When very severe, the writer has often referred to the pain as being similar to the pain induced by gripping the head in a vise and alternately loosening and tightening the vise. So it is with the migraine pain—it will ebb and flow, in its severity. In addition, one feels unable to hold his head up straight, and is unable to think or concentrate. He will usually perspire quite a bit, and there will usually be an excessive salivation and lacrimation. These attacks will last from a couple of hours to a week, the intensity varying from time to time. The writer has found that during his childhood these attacks were almost always accompanied by nausea and vomiting, but since reaching the adult stage the nausea and vomiting have been completely missing from the picture. One might also add that when the attack finally does subside it leaves the patient quite exhausted and he will easily fall into a deep slumber. Likewise, with the subsidence of the attack one finds, very often, that the side of the head that had suffered the attack is rather tender to the palpating finger.

There has, quite naturally, always been present the question of suitable therapy in the treatment of migraine. And many forms of therapy have been tried. Alvarez had observed that in many cases where women suffered from migraine attacks these disappeared with the onset of menopause. This then suggested to him the question as to whether one can cure migraine in a woman by inducing a menopause. In a report on a series of 42 cases wherein menopause was induced by a complete or partial oöphorectomy or hysterectomy, or by a sterilizing dose of radium, Alvarez found that in only 6 cases did a cure result. In the rest the headaches were either unchanged, became milder, or became worse. He concluded, therefore, that such a treatment was not to be recommended in cases of severe migraine.

J. R. Nakada reported on a case that he treated with histaminase and affected a cure. This of course brings up the question whether migraine attacks may perhaps be due to an overproduction of histamine. To date, though there seems some evidence that there is a relationship between a histamine headache and a migraine headache, their identical relationships have not, as yet, been proven.

Alvarez and Mason, working at the Mayo Clinic have been using 100% oxygen in the treatment of migraine headaches. In a series of 100 cases receiving such treatment, 62 obtained complete or partial relief and 38 obtained no relief. These investigators claim that the best results are to be looked for in typical migraine headaches and in these cases oxygen seems to work about as often as ergotamine. Oxygen is usually preferred by the patient, when it works, since there are no unpleasant side effects. In cases of typical migraine, there are about 4 chances out of 5 that oxygen will relieve it, the results being better when treatment is promptly instituted.

Hines and Eton, also at the Mayo Clinic, have found that Potassium Thiocyanate is usually effective in relieving a migraine attack that is associated with hypertension, and, too, that it may even be effective in some instances where the blood pressure is found to be within the normal range. It is their claim that for effectiveness one should attain a blood level of 6-12 mg. per cent, and their advocacy of the drug is also based on the fact that its use is unattended by any toxic manifestations.

Despite all the above-mentioned therapeutic agents or procedures, the drug of choice still seems to be ergotamine tartrate. Some of the more eminent investigators in this field, men like Wolff, Graham, Sutherland, von Storch, et al, are of the opinion that the most effective way that we know of to-day to abort or terminate a migraine attack is by the use of ergotamine tartrate.

As a last word on the subject one may well point out that even with ergotamine tartrate, the drug of choice, there are many migrainous patients that do not respond and continue to suffer the incapacitating effects of this disease. And it is the writer's earnest belief that until such time that the undoubtedly more complicated mechanism of migraine is better understood there will be no specific drug for its treatment. Perhaps the day is not too far off when all the various "forms" or "types" of migraine that we have now will be found to be united by a common etiological factor. Then, and only then, can we hope to claim that we have effected a cure for migraine, "the commonest clinical entity that civilized man happened to fall heir to" (Wolff).

(Continued on page 34)

* * * *

BIOLOGICAL FACTS

The mean weight of both sexes in old age is that which they had at 19.

THE AMERICAN SOLDIER

LIEUTENANT-COLONEL LESTER S. JOHNSON, M.D.
Associate Professor of Military Medicine,
The Chicago Medical School

Democratic America, traditionally non-militaristic, viewed the approach, and absorbed without disconcertion, the impact of World War II, meanwhile, organizing behind an initial protective force, the most formidable military power in history. This was possible through the integration of such national factors as military policy, wealth, industry and the will of the people linked with the military effort. In essence, though, the real strength of America, aside from God's bounty, lies in the creative intelligence, initiative and resourcefulness of our people that stems from the stalk of equal opportunity.

The character endowment in our national pattern is such as gives fighting men ability to fight and win against odds. Other qualities are idealism, adaptability, and imagination. Young men in their country's service imbued with these concepts appreciate the sanctity of human rights, something which has ever made men formidable in battle. In war it is axiomatic that spiritual values are preponderant over the material. Our soldiers readily accept the discipline of war, adjust to its hardships, and their fertility in expedience is noteworthy. Each is potentially a little army, able to think, plan, and execute.

Countries where the plain man is taught to keep his place deny him the development of such imperatives in leadership as initiative and self-confidence. Our people feel the equality which enables the best to rise and lead their comrades, and a nation which so stimulates the worth of her sons is enriched indeed. From America's liberalism has come the fruition of moral over material values, far beyond Napoleon's maxim, proving, *a priori,* the wisdom of our rule. Upon this premise, America is inviolate and, given training, equipment and leadership, is invincible on land, sea or in the air; the truth of this being attested from Concord to North Africa.

Open warfare with its quick decisions and fair fighting is the characteristic American way of battle. When positional (trench) warfare obtains, American strategy and tactics aim to get things out in the open where the issue may be decided by maneuver and action. Long occupancy, or the garrison of subjugated countries finds little accord in the national temperament.

We applaud practical sense more than sentiment, and one may count upon this, as well as humor and sportsmanship, in an American Army, whether trained or not. Napoleon would harangue his soldiers to the highest pitch of their racial susceptibility, while a similar talk to Americans would be received with derision. Chauvinistic heroes exulting in the path of glory that leads but to the grave, or the traditional British hold-the-ground-at-all-costs, are patterns that the American soldier discounts in favor of Indian logic, wherein the warrior retires speedily from a bad position without becoming disorganized or giving up the fight.

American soldiers appreciate simplicity—one syllable words, if possible—an astute quality if one considers that the simplicity of a thing is a measure of its perfection. His psychology is based upon the "why of things," yet, is consistent with a discipline which teaches obedience as a principle rather than rigidly as the first and last duty of a soldier. He obeys orders in the knowledge that he cannot know all things, and appreciates automatic response to command as action vitalized by the will of a leader. Courage is taken for granted, but it may, in accordance with natural law be governed by psychological or other considerations. However, the American spirit connotes a bravery equal to that which any fanatical or ideological fatalism may adduce.

"Many are called but few are chosen." This quotation from Holy Writ could be well said of the soldier, for upon the scale of prerequisites are balanced his

physical, mental, moral and psychic qualities against the exacting standards of modern war, which accepts only the fit.

Generally, soldiers classify by attitude and moral sense into average, above average, and below average types. The average type is the large group upon which the human equation is normally based. They take things in their stride and perform a full measure of duty, but they gripe and may be said to be contract-minded, especially about rights and privileges. The above average type makes no demands, needs no prompting and virtually no supervision once he acquires training. The below average type is many times a problem of attitude, weakness, or moral sense, rather than inaptitude or inadequate mentality. Sometimes there is displayed brilliance, so that causes must be sought in abnormal personality upon a medical basis. The below average type needs constant supervision, may be inept, or have a limited field of application, and does not integrate well in military life. The alcoholic is a below average type.

A trained soldier is not only a valuable product as an efficient fighting machine, but the experience of war, which steels him throughout life, insures a society that will not grow effete.

The army objective is to bring out the best in a man by systematically building him physically, mentally and morally. As a basis for all service, physical training is initial in building up to symmetry men below standard and in improving muscular harmony. Games, drill and exercise vary to give reflex response to command, and to develop individual initiative and mental-physical coordination. Height, weight and breadth, assume under exercise, direct proportions to strength. The soldier gains confidence and courage through feeling physical power, for physical condition, probably more than any other factor, influences morale. Hikes, full pack and overnight, together with calisthenics and games, gradually consummate the physical fitness needed in campaign. Equal development of all muscles, quick responsiveness to the will, and accurate coordination of movement are not so often found as a result of work as of play. A season of football is better drill in single and concerted movement than an ordinary course in company drill. However, habitual drill, in precise close order formation, is the best mechanism known for the inculcation of discipline and its growth into unremitting effort in the appropriate sphere of activity. Discipline takes priority over other qualities insomuch as it is the prime factor of success in time of war.

The brain pattern and training skills of the soldier must become inherently fixed, reflex, and standard. This is obtained by constant practice and repetition until function is automatic, precise, and even meticulous in all things from basic drill to deciphering code. Then, regardless of stress or confusion, the soldier will carry on.

* * * *

Personality is the sum of one's qualities, as knowledge and experience are the sum of what one knows. Intelligence, or the power of mind to assimilate knowledge and to learn and profit by experience, is one of the most important personal qualities in war, if it be stable. The mental age of the average soldier is between 12 and 16 years, regardless of attained age. However, the high potential of brain power revealed by education and genius shows that the race operates on but a margin of its mentality. The World War soldier's mentality averaged around 12.6 years. In group fighting, emotion tends to displace intellect, and, except for the officer who needs all his faculties, innate stubbornness, or fanatical enthusiasm, wins more battles than a high I.Q.

Leadership is a personal quality, in a sense an art, made manifest by directive ability, force of personality, and some respected attribute above group level. The quality has an inherent basis, although it may be acquired and developed to high degree. Some great leaders have been illiterate, but such mastery betokens keen perception and natural power of mind.

In war, though, mentality does become talent for solution of its problems, adaption of means to ends, and insures readiness at the critical point or moment. An abstract of mental qualities makes evident individual differences which, in the army, are evaluated by test, and classified. These tests rate intelligence, aptitude, personal data, and a scored interview. The commission threshold requires a minimum intelligence quotient of 110. This procedure to appraise ability is the best initial method, outside the gauge of known and demonstrated qualification, that can be devised. It has assured that a large percentage of the round and square pegs have been properly placed.

Self-preservation is the first law of nature, and fear is its activator, but courage may rise above and hold instinct in abeyance. A simple philosophy for the battlefield, is, "Kill, or be killed." Fear, to which most veteran soldiers become blasé, is both a protective mechanism and creative motive, but, as nature's

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THE ROLE OF THE NERVOUS SYSTEM IN GLANDULAR SECRETION AND SOME EXAMPLES OF CLINICAL SIGNIFICANCE

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GLANDS are principally epithelial cells occurring singly or in groups, and specialized to secrete substances which promote metabolism. All of their secretions are important and some are vitally necessary. They are liberated from the cells which produce them, in some cases by humoral agents of the blood stream, but more often by the nervous system. Which of these two factors is responsible for secretion in a given gland is not always clear; hence considerable confusion has prevailed in selecting proper therapeutic measures during glandular disorders.

For instance, in treating Graves' disease, the cervical sympathetics have been cut on the assumption that hyperactivity of the thyroid gland was maintained by secretory nerve fibers to the follicular epithelium of that gland. Cannon and associates in 1915 had produced a syndrome resembling Graves' disease by splicing the central stump of the phrenic nerve to the cervical sympathetic trunk in a cat. However, the results of sympathectomy to relieve such symptoms in humans were ineffectual, and, as subsequent work has indicated, for a good reason. Marine transplanted the whole thyroid gland in dogs and the resulting grafts not only regenerated to keep the animals in good health but showed a microscopic picture indistinguishable from the normal. Nonidez supplemented these findings in 1935 by using a variety of the most likely neurological techniques on the dog thyroid, and he concluded that the nerve content of the thyroid is confined to the blood vessels.

The nervous control of secretion in many glands is indisputable. Salivary secretion was demonstrated experimentally in 1868 by Heidenhain who produced a copious outflow from the submaxillary and sublingual glands by stimulation of the chorda tympani. About 1900 Dreyer showed that adrenalin is secreted by the adrenal medulla on stimulation of the greater splanchnic nerves. The effects of psychic stimulation on glandular function were, in broad outline, common knowledge long before the analytical scrutiny of science. No one will suppose that Henry VIII was unaware of the causes of salivation, etc. Alvarez ('29) quotes from a noted French gourmet, Brillat-Savarin, who wrote in 1839 as follows: "Memory recalls foods that have flattered its taste; imagination fancies that it sees them . . . the whole nutritive apparatus is moved. The stomach becomes sensible, the gastric juices displace themselves with noise, the mouth becomes moist and all the digestive powers are under arms, like soldiers waiting the word of command. After a few moments there will be spasmodic motion, pain, and hunger." At about this same time the misfortune of Alexis St. Martin opened the functioning stomach literally for the first time to the gaze of scientific men. This oft-quoted anecdote in which the victim received a permanently fistulous stomach from a bullet wound served to throw considerable light on the factors controlling gastric secretion. Not only was it observed (by Beaumont) that the anticipation of food brought forth the gastric juices, but also that strong emotional excitement had the opposite effect, namely, that of inhibition. The Pavlov pouch used so extensively in dogs is an outgrowth of this incident.

Just recently (Science, December 3, 1943), Dr. Wolff of the Cornell Medical College has reported another human subject with a fistulous stomach observed regularly during the course of the latter's daily duties. The patient, a man of 56, occluded his esophagus with scalding clam chowder when he was

9 years of age and has since been fed through a funnel. His gastric mucosa has grown out through the stoma and is easily studied. His emotional states have been correlated with the appearance and activity of the stomach. It was found that, normally, every two or three hours, there was hyperemia, hypersecretion of acid and vigorous contractions of this organ. States of sadness and fear from events occuring in line of duty resulted in pallor of the gastric mucosa and decrease in the rate of acid production. Conversely, anxiety, hostility and resentment produced a reddening engorgement of the mucosa, accelerated acid secretion, and vigorous contractions. The author found the mucosa in this state to be very susceptible to injury which promptly healed if afforded the proper mucus protection. However, if mucus were removed from any small point of hemorrhage and gastric juice applied to the erosion, accelerated acid secretion and hyperemia of the whole mucosa resulted. This state lasted for half an hour after the original stimulus, but returned to normal when the lesion was again covered by mucus. This direct evidence, combined with the many clinical cases where peptic ulcer is correlated with a history of continued anxiety, hostility, etc., led the author to conclude that "Hyperacidity, gastritis, minor mucosal erosions, and, finally, peptic ulcer occurring during the course of sustained emotional tension should not be looked on as separate clinical entities. The evidence indicates that they are all phases of the same pathologic process."

In general, then, let us say that the glandular epithelium of the alimentary canal is known to receive a considerable amount of autonomic innervation. The same can be stated for the reproductive tracts. Up to the present time there have been but two categories of classification insofar as the relation of glandular secretion to the nervous system was concerned, namely, (a) those glands under nervous control, and (b) all other glands of doubtful or obscure nervous connections. Now it seems entirely fitting to add a third, (c) those glands devoid of a regulatory nerve supply. At the risk of appearing dogmatic, it it most likely that the thyroid belongs to this last group for reasons already stated. The writer has what he considers even better reasons for placing the adrenal cortex in the group strictly under humoral control. Briefly, it has been found in the laboratory here and at the Northwestern University Medical School that, instead of a fathomless maze of fibers penetrating the whole adrenal gland, the nerve supply to the adrenal approaches the gland in well-defined bundles which penetrate the capsule at definite points and then pass through the cortex to the medulla where they terminate around the chromaffine cells. In other words, the cortical parenchyma is not functionally innervated.

Humoral control of glandular secretion is not a new idea. In 1902 Bayliss and Starling discovered the hormone, secretin, which occurs in the duodenal mucosa and activates the pancreatic acini. But there is considerable evidence that the pancreatic secretions, both exocrine and endocrine, are also regulated to some extent by the nervous system. Besides the adrenal cortex, the thyroid, and possibly the gonads (including the corpus luteum), there seems to be no other major gland which can be considered as strictly dependent for its secretory activity on agents circulating in the blood. The pars distalis of the pituitary would be highly suspect if it were not for the work of Uotila ('39) to show that the thyrotropic function is lost in transection of the stalk of the pituitary. However, the pituitary of the rat has been transplanted functionally so that its gonadotropic function at least is maintained (Cutuly '41).

The relation of many glands to the nervous system is still highly debatable. The secretory control of the pars distalis, the islets of Langerhans, the liver, the intestinal and uterine glands, is still shrouded in uncertainty. Claude Bernard (1852) produced a hyperglycemia and glycosuria by puncturing the floor of the fourth ventricle. Just what happened no one to this day knows, but it is assumed, from our knowledge of the central disposition of the autonomics, that he interrupted some pathway between the hypothalamus and the periphery. Where these peripheral nerve fibers lead is again difficult to say. Some current opinion favors the view that carbohydrate metabolism is partially regulated by the automatic nerves supplying the islets of Langerhans and cells of the liver and adrenal medulla. The islets supplied by the vagus would keep the blood sugar down within normal limits while the liver and adrenal collaborate to supply sugar as it is needed by the body. This is an attractive hypothesis which some day may prove to be correct. As yet, the anatomical demonstration of nerves to the liver cells and to the islets of the pancreas is lacking. This doesn't invalidate the hypothesis just mentioned but it does seriously weaken it. Even as late as 1940, Alexander was unable to see any nerves within the substance of the liver although he used one of the best recent neurological stains and was able to describe in detail the innervation of

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THE NEW CONCEPT OF VIRUSES

ARTHUR R. LEVIN AND BURTON W. ROCKLIFF

For the person who likes his scientific knowledge to be well-classified and easy to tuck away into properly labeled cubby-holes, the subject of filterable viruses must be very annoying. Only one who has completely ignored the work done on viruses during the past twenty years can afford to present a simple definition of a virus, for viruses are not necessarily filterable (a vague term anyway) nor are they necessarily sub-microscopic. Furthermore, there is much question as to whether certain viruses are even living organisms. The only characteristics that *all* viruses show are an inability to reproduce (or be reproduced) outside of living cells, and an invariably pathological effect upon living tissue. However, there is even some recent evidence that viruses need not be pathogenic.

Out of all this confusion has emerged a theory as to the nature of viruses which is based upon a great mass of experimental findings. But before we discuss this theory, let us review some of the characteristics of viruses with which such a discussion must deal.

First of all, viruses are extremely small, and in recent years a great deal of interesting research has been carried out with the object of measuring the particle size of different viruses. The use of photomicrography with ultra-violet light allows for greater resolution, since the wave-length is shorter, and with such illumination particles which are either invisible or indistinct with ordinary microscopic methods can give photographic images clear enough to be measured. This method, however, is applicable only to the larger viruses.

Smaller viruses have been measured by indirect methods. The first of these consists of filtering the virus through specially prepared membranes of modified cellulose. The pore size of these membranes can be controlled with reasonable accuracy, and by finding that membrane through which a given virus will just pass, the size of the virus can be determined. Another indirect method consists of ultracentrifugation. When gravity or centrifugal force acts upon particles in suspension, the larger particles are moved at a faster rate than the smaller ones, and this rate of movement varies directly as the mass of the particles. In determining the sedimentation rate, and thus the size, of viruses, a high-powered centrifuge is used which may develop a centrifugal force 50,000 times as great as the force of gravity.

These methods have shown that the viruses range in size from very small particles that approach the dimensions of protein molecules, to microscopically visible bodies that are comparable in size to some of the smaller bacteria. The following table allows a comparison:

Particle	*Diameter in Mμ*
Serum albumin	5
Poliomyelitis Virus	10
Bacteriophage S 13	10
St. Louis Encephalitis virus	20 —33
Tobacco mosaic virus	30
Influenza virus	85 —100
Rabies—street virus	160—240
Rabies—fixed virus	100—150
Vaccinia	125—240
Psittacosis virus	275
B. Prodigiosus	750

This extreme range in the size of viruses is not to be dismissed lightly. We are not used to thinking of a correlation between the size and the physiological activities of organisms, but when organisms approach the size of molecules, such a relationship becomes likely. This variation in size will later be integrated into the general picture of viruses.

The one completely consistent characteristic of viruses is that they will increase in amount only in the presence of living cells. The use of the word "reproduce" has been consciously avoided for reasons that will become evident. Viruses are not the only pathogenic agents that refuse to grow in artificial media, however. The *Rickettsia* have never been grown in lifeless media, and *Mycobacterium leprae* still has not been satisfactorily cultured. The difficulty here may lie in the fact that the methods of preparing and controlling the media are not delicate enough to duplicate the environment needed by the organism. In the case of viruses, however, it is probable that a suitable lifeless medium will never be found, for the simple reason that *viruses require an intimate environment of living, active protoplasm for their multiplication.*

This condition may be simulated by tissue cultures containing living cells, particularly embryonic cells. Animal inoculation is a common method of *in vivo* cultivation, but since the viruses are extremely fastidious in regard to the type of cells in which they will

thrive, the site of inoculation must be taken into account. Injection of the virus into the chorio-allantoic membrane of a developing chick embryo has proved to be one of the most satisfactory methods.

When we consider the susceptibilities of the viruses to physical and chemical agents it is difficult, for the most part, to draw any sharp distinction between them and the bacteria. Many of the viruses withstand glycerol and certain other bactericidal chemicals to a greater degree than the non-sporing bacteria, but in regard to heat there is much variation. Many viruses are like the non-sporing pathogenic bacteria in their sensitivity to heat at 50 to 55 degrees Centigrade. Some, however, including those of plant diseases, possess a higher resistance to heat than most non-sporing bacteria at temperatures as high as 70° C., or even 80° to 90° C. in the case of the tobacco mosaic virus. Many viruses are very resistant to dessication, in this respect resembling bacterial spores. Viruses, like bacteria, are destroyed by ultra-violet light. The fact that viruses are "killed" by the same external agents as living organisms does not necessarily prove that they are living entities since certain biological substances, such as enzymes, are inactivated by various physical and chemical influences which kill living organisms.

It has been fully established that the viruses represent antigenic entities capable of inciting *in vivo* the formation of specific antibodies which can be demonstrated by serological reactions similar to those applicable to bacteria. This does not necessarily imply, however, that viruses are living organisms, since all complex natural proteins are antigenic, and the antigenic properties of bacteria depend on their chemical constituents. Thus, the antigenic nature of the viruses signifies either that they are living organisms capable, like bacteria, of synthesizing protein substances, or that they are themselves proteins which have been synthesized by some other living agent.

The state of immunity following the recovery from many of the virus diseases is often very lasting, even life-long, as after smallpox, measles, poliomyelitis, and yellow fever. Some writers have gone so far as to emphasize this as a difference from bacterial diseases, but among the virus infections numerous examples can be cited in which the post-infection immunity is of short duration, as in the case of the common cold and herpes febrilis.

Both plants and animals are susceptible to virus infections. The viruses affecting Man are named according to the diseases which they cause, and are classified according to the type of tissue invaded. Thus, such diseases as rabies, poliomyelitis and the encephalitides are classed as "neurotropic," while smallpox, herpes zoster and foot-and-mouth disease are considered "dermatropic". The lesions of the common cold, yellow fever, mumps and influenza are so located as to be designated "viscerotropic". This predilection for certain tissues should not be considered any more remarkable than that exhibited by most other pathogenic organisms, and is, in fact, less so, for viruses are so much more intimately dependent upon the very life-processes of the cells they infect.

The presence of abnormal intracellular structures in the lesions of virus diseases constitutes perhaps one of the most characteristic features of this group of infections. These have been generally designated as 'inclusion bodies.' In some cases they are observed in the cytoplasm, as in rabies, variola, vaccinia, molluscum contagiosum, and fowl-pox; in others, within the nucleus, as in yellow fever and herpes febrilis. Since they were first carefully studied (in vaccinia by Guarnieri, 1894) their nature has been the subject of much speculation and controversy. In man and animals the inclusion bodies are more or less rounded in shape, of varying size even in the same disease, usually with a sharply defined outline, but not presenting any very definite internal structure as seen in the usual microscopic preparations. Many of them are strongly acidophilic when the tissue is stained with a solution combining a basic and an acid dye. In some cases, however, they react to the basic dye.

There are two main theories in regard to the composition of inclusion bodies. In the first place, it has been suggested that inclusions are the result of cellular degeneration in the host, thus being reactionary products. It is possible that the well-known Negri body is formed from nuclear material, or else from neurofibrils, but recent evidence has shown that many other common types of inclusions cannot be satisfactorily explained by this theory.

Recent studies have shown that inclusion bodies can be resolved by micromanipulative and other methods into more minute 'elementary' bodies, such as may be seen independently inside cells or free in inflammatory exudates of certain virus diseases. These elementary bodies, in most cases, are believed to be the actual virus units. It is of interest to note that these elementary bodies were first observed in variola and vaccinia as long ago as 1886 by Buist of Edinburgh, who used an ordinary microscope. In 1906

they were again described and studied by Paschen of Hamburg. It is probable that the most feasible explanation of the composition of the majority of inclusions is that elementary bodies first enter the cell, sometimes reaching the nucleus, and then proliferate to form a colony. The cell itself probably reacts and produces a covering which gives the inclusion a more or less homogenous appearance. Some investigators have modified this idea, and regard inclusions as some phase in a hypothetical life-cycle of the virus in which a relatively large structure is formed containing within it the elementary filterable forms. The nature of inclusion bodies is further complicated by the fact that bodies similar to those occurring in virus infections may occur intracellularly in tissues which are either healthy, or else affected by a disease of non-virus etiology. Conversely, inclusion bodies are not found in all virus infections, perhaps due to the relative crudeness of our staining methods.

Considerable work has been done by T. M. Rivers and his associates on the elementary bodies of vaccinia. Methods of cultivating large quantities of vaccinia on the scarified skin of rabbits, and ways of washing and isolating the elementary bodies were perfected. Chemical analysis of these minute particles yielded the following data:

Organic phosphorus	0.59%
Total nitrogen	15.3
α-amino nitrogen	3.4
Carbon	33.7
Total lipoid	5.7
Cholesterol	1.4
Phospholipid	2.2
Neutral fat	2.2
Reducing sugars	2.8

The presence of these constituents indicates a similarity to the protoplasm of higher organisms. Thymonucleic acid was isolated, and also guanine and adenine. It must not be supposed that all of these substances are inseparable parts of the infective entity. Certain cellular constituents of the host may have been merely absorbed upon the surface of the inclusion bodies. Extraction of the particles with ether, for instance, did not affect their virulence, and the presence of lipids thus appears to be incidental. The finding of nucleic acid is consistent with the results of other workers who have analyzed various viruses. Stanley found his tobacco mosaic virus to contain 5% of yeast nucleic acid, an interesting variation from the animal type in vaccinia.

We should mention the fact that bacteria are affected by filterable substances which recent evidence has shown to be minute viruses. These so-called bacteriophages cause a lysis of the bacterial cells they parasitize, with a simultaneous increase in the amount of bacteriophage. The possibility that such substances are autocatalytic enzymes has been suggested, and some writers have even extended this theory to include all viruses.

We come now to the question of whether viruses are inanimate agents or living organisms, and in considering this we will elaborate upon a concept of viruses first expounded by Green in 1935, and later by Laidlaw (1938).

First of all, what do we mean by a "living organism?" The forms of living matter are so variable and complex that no simple definition of life is acceptable, refuge being taken in a listing of the characteristics of the phenomenon, such as irritability, growth, reproduction, movement, adaptability and metabolism. The fallacy of such a differentiation lies in the fact that 1) some living organisms do not exhibit certain of these characteristics, and 2) some inanimate processes can be interpreted as demonstrating them. Reproduction is usually considered to be the one definite criterion for life, but a crystal of copper sulfate dropped into a supersaturated solution of this salt will bring about the crystallization of the dissolved salt upon itself, and the crystal will appear to be growing. Even more pertinent is the fact that a small amount of trypsin added to a solution of trypsinogen brings about the conversion of the trypsinogen to trypsin. The trypsin has increased in amount through a sort of autocatalytic effect upon its precursor substance. Can this be considered reproduction? As previously mentioned, some workers believe that the reproduction of viruses is a similar process.

Metabolism is a well-nigh universal characteristic of living things, but almost any oxidation-reduction chemical reaction simulates it. In fact, metabolism is merely the measure of the chemical activity of the organism, and this chemical activity involves a transfer of energy. A sound understanding of the relation of these energy changes to life will be useful in considering the nature of viruses.

The organisms at the lower end of the evolutionary ladder illustrate most clearly the basic *purpose* of living matter. The algae, for example, are single-celled or colonial plants which, by means of a catalyst called chlorophyll, are able to synthesize living protoplasm from inorganic substances, using sunlight as

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THE MECHANISM OF WOUND HEALING AND INFLUENTIAL FACTORS

MURRAY M. FELDMAN

The process of healing is fundamentally the same in all wounds. The few quantitative differences that do exist are dependent on the amount of tissue destruction and, to a certain extent, on the presence of sepsis.

A wound is the result of an injury or traumatism to any of the tissues of the body, with or without a solution of continuity. Thus, there are various types of wounds. Some of these are:

Puncture—a wound made by a narrow, pointed instrument. Its depth is greater than its diameter at the surface.

Contusion—a bruise or injury to the soft parts without a break in the skin.

Laceration—a tear of the tissues, usually resulting in the edges of the wound being jagged and irregular.

Incision—a clean cut made with a sharp instrument.

Abrasion—a scraping of the skin which leaves a bleeding surface, but does no injury to the deeper tissues.

Fracture—a break in a bone. The types of fracture differ with the extent and severity of the injury to the bone and surrounding tissue.

The conditions found in most types of wounds are hemorrhage, escape of lymph, and a destruction and retraction of normally continuous tissue. The control of hemorrhage is one of the most important factors in wound healing, as this has to be achieved before proper repair can take place. The work of Bier (1897), Kuttner and Baruch (1920), and Magnus (1923), showed that there appeared to be a spontaneous stoppage of blood flow independent of blood clotting. This stoppage seems to be due to segmental spasm and to contraction and retraction of the severed blood vessels. Stegman (1924) concluded from his experiments that the cessation was due to a diversion of the blood stream around and away from the site of injury. He called this phenomenon "autonomous reversal of the circulation."

Repair in a wound can be divided into two types—healing by first intention or primary union, and healing by granulation. In the former type, the cut surfaces are brought closely together so that there is no appreciable loss of substance, bleeding is at a minimum, and infection is usually absent. This differs from healing by granulation in that in the latter there is a loss of substance and the gap is filled from below by a mass of young vessels and cells called granulation tissue.

Proliferation of cells is probably due to the fact that a chemical stimulation is present. This stimulation is provided by the presence of degenerating cells. The work of Carrel (1921) has shown that removal of debris and blood clots from an aseptic wound results in retardation of healing. In fact, at the end of a three week period no change in the wound can be noticed.

Blood clotting is a basic agency in the primary closure of wounds. The constituent fibrin covers the surface of the wound and aids in the coalescence of the opposite sides. The fibrin net serves as the avenue for cellular extension of surrounding tissue and the medium for migrating cells. The fibrin becomes impregnated with blood cells and tissue fragments. The process of clotting then takes place and produces the scab in its initial stage. This scab serves to protect the tissue beneath against drying and further injury.

It is difficult to draw a hard and fast line between repair and inflammation. Both represent the response of the body to an irritant. The determining factors in inflammation are the nature and intensity of the irritant, the site of injury, and the duration of irritation. Hyperemia, serous exudate and leucocytic emigration are the phenomena characterizing inflammation. The inflammatory process aids in inducing the fibrinous coating of the wound surfaces, and in the later stages leads, through phagocytosis and enzymic digestion, to the removal of the products of exudation and degeneration. Since it constructs and destroys, it contributes to wound healing in both capacities.

As mentioned before, the processes of repair in wounds are primary union and granulation tissue formation. While it is true that certain additional factors enter into healing by granulation, the mechanism in both is virtually identical. In healing by primary union, the knife or any other instrument acts as an irritant, so that the cut edges show inflammatory changes in the shape of vascular dilatation and exudation, and a small quantity of fibrin, plasma, and leucocytes will be present in the thin gap. Two types of cells divide actively, the connective-tissue cell and the vascular endothelial cell.

The fibroblasts have a stereotropic response; that is, they tend to move chiefly in contact with solid or semi-

solid bodies. The work of Loeb (1920) and Carrel and Ebeling (1926) showed that the fibroblasts move along the fibers of fibrin, and that this movement is from all possible directions. Their manner of migration into the wound is by cytoplasmic streaming in a straight line. Their activity is polarized, the distal end of the cell projects its processes into the wound while the proximal end merely follows. They never lose contact with the tissue from which they come or with one another. As a result of this affinity the entire colony becomes the pioneer agency for the organization of the blood clot with cellular regeneration.

Synchronously with the fibroblastic proliferation, there occurs a proliferation of vascular endothelium. Protoplasmic buds are formed from the surrounding endothelial tissue, and by rapid growth establish connections with one another until a branching network is formed. These buds hollow out and a lumen is established which becomes continuous with the lumen of the parent capillaries. This excessive vascularity explains the redness of the initial scar. As will be shown later, the presence of a rich blood supply is essential for proper repair.

Now, as the invasion of the fibrinous deposits by the fibroblasts proceeds, so the fibrin, which played such an important role immediately after the infection of the wound, now yields to a process of resorption. This latter process, as well as the laying down of collagen fibers, has still not been fully explained. Originally, the gradual decrease and ultimate disappearance of the fibrin net was credited to the fibrolytic activity of the neutrophils and, in a measure, to the influence of young fibroblasts and angioblasts. Up until 1916 it was the prevailing idea that the fibroblasts entered the blood clot for the purpose of building connective tissue through intracellular action. This manner of consumption and replacement of the fibrin net was ascribed to a positive chemotropism by the new tissue cells to the fibrin mass, and that this phenomenon attracted the tissue cells to the fibrin in large numbers. The permanent tissues which ultimately occupied the wound spaces were, therefore, identified as products of intracellular action.

The newest theory maintains an intercellular origin of collagen fibers. Bartsell (1916) proposed this theory based on his experiments in wound healing in frog skin. He claimed that the fibrin clot possessed the capacity to transform itself into fibrous connective tissue. This reaction occurred by direct intercellular action. The only purpose of the fibroblast was to break up the larger bundles by their movements among them. His work has been confirmed by many others. Herzler (1929) found that the initial processes by which the fibrin net is transformed into fibrous tissue are chemical and that the cell is not primarily the active agent.

At the present time both theories are still being propounded, each being equally supported by the various workers in the field.

One of the final stages in wound healing is epithelial restoration. This is one of the most rapid processes involved in the mechanism. The chief characteristics of epithelial participation are centripetal movement of the surrounding epithelium, reorganization of proliferated cells into the definitive types, much as in ordinary growth and replacement, and the restoration of a continuous smooth surface. At the same time, epithelial cells are proliferating rapidly in the deeper layers to regenerate the injured area and to restore original stratification. Rand (1915) said:

"In general, an epithelium will not tolerate a free edge. When such an edge arises, accidentally or otherwise, the epithelium extends until, if possible, the free edges meet and unite with some other portion of the same layer or with another epithelium. The essential function of an epithelium is to cover a surface continuously."

The specialized structures, such as sweat glands and hair follicles, are not replaced.

In healing by granulation all the above processes are repeated, but in greater measure. The additional factors to be dealt with spring from the complexities arising in gross injuries. Mainly, these are organization of granulation tissue, retardation by infection, and the presence of foreign bodies. Here, the fibroblasts are unable to sew the surfaces together, and the gap is filled from below by a mass of young vessels and cells called granulation tissue.

The gap is first filled with a mixture of coagulated blood, fibrin, and inflammatory exudate, and upon this ground work the vascular endothelium and fibroblasts build the granulation tissue. In addition to these cells, wandering cells form an important element of granulation tissue. In the early stages these are mainly polymorphonuclear leucocytes, which migrate from the new capillaries in response to the irritation. They appear in especially large numbers in the scanty exudate on the surface, and the name "laudable pus" has been given to this covering. It probably serves to keep the surface free from infection. In the later stages, and in the deeper layers, lymphocytes and macrophages play the predominant role. The macrophages give a much better protection than the

leucocytes. True healing commences only when the macrophages and leucocytes have overcome the infection.

In Nelson's Surgery, Vol. I, an article entitled "Surgical Pathology" gives the following detailed description of granulation tissue.

"Microscopically, granulations are found composed of several loops of newly formed capillaries perpendicular to the plane surface of the wound with an accompanying stroma of young fibroblasts. The intercellular substance is largely fluid with a few delicate fibrils. In addition there is a cellular infiltration with variable proportions of polymorphonuclear leucocytes and round cells. On the surface of the granulations, although these may appear grossly naked, there is a thin film of exudate. This consists of fibrin, amorphous debris, and leucocytes, many of which are necrotic."

Let us return to a consideration of cell movement, as many investigators are not in full accord as to its cause and mechanism. They are not certain as to what stimulates cell movements and whether these movements are ameboid or by cellular proliferation. As far back as 1899, Peter's artificial cultivation of epithelial tissue convinced him that the cells are motile and their movement ameboid. Loeb (1902) and others agreed with Peters as to the ameboid movement and added the factor of stereotropism. Many others, among them Marchand (1901), Werner (1902), and Poynter (1919), agreed that the movement of epithelium over mammalian wound surfaces, particularly at the border zone, was due to active wandering cells and not to mitosis. Cell multiplication made its appearance only at a later stage.

Rand (1905) suggested a wound stimulus. To quote him:

"The most important factor in the earliest part of the process of reparation is cytotaxis; the individual columnar cells of the existing epidermis are affected by some directive stimulus and respond by an active migration which results in the covering of the surface of injury by a protective epithelium—the first definitive step toward regeneration."

On the point of stimulus to movement, Taube (1923) said that the degenerating products of injured cells set up a chemical stimulation which caused the uninjured cells in the edge of the wound to migrate, and later, to divide. This seems to have been confirmed by the work of Maximow (1925) and Carrel (1924). The latter gave the name trephones to the substances in embryonic tissue juices, in leucocytes, and other tissues which promote repair.

The final stage in the mechanism of wound healing is the formation of the cicatrix. In the beginning, the scar is rich in cells and blood vessels, but in due course it becomes pale and its vascular and cellular nature diminishes greatly until it is purely a mass of epidermis and fibrous tissue. The regenerated epidermis shows normal stratification. Beneath the epidermis there is a thin layer of loose connective tissue, and beneath this is dense connective tissue. At the close of epithelial healing the scar is at a maximum in each dimension, but within a reasonable time progressive shrinkage occurs. In old granulating wounds the deep stratum consists of very numerous, dense collagen fibers. The fully healed scar of the skin remains a fibrous mass and its epidermal covering lacks the typical skin appendages. Eventually, elastic fibers reappear.

Most animals, so far as experiments have gone, show a capacity for prompt repair of damages. This capacity for repair is a relative one in that in the higher vertebrates one does not find the degree of regeneration that is found in the lower animals. Besides this, wound healing is not a matter of local response alone, but is a process in which external as well as systemic factors play an important role. To consider all these factors in such a short article is practically impossible. However, the more important ones will be briefly discussed.

One of the most important factors is a good blood supply. Although there may be sufficient physiological or artificial stimulus to fibrosis, new cells will not form unless the surrounding tissues transmit suitable building materials from the blood stream and transport the waste products from the field of repair. It has been shown that wounds heal less rapidly in patients with severe anemia. This is also true for wounds in areas of decreased blood supply, as in a limb affected with marked arteriosclerosis. On the other hand, wounds in excessively vascular areas, such as the face, heal rapidly.

The above is closely connected with the nervous system. This has been shown by Lieb (1902) who resected the sympathetics, or else removed the superior cervical ganglion, unilaterally in rabbits, and observed that the ear on the operated side became hyperemic and healed more quickly. This is due to the fact that by such an operation the influence of the vaso-constrictor nerves are removed and the blood vessels dilate, assuring the injured part a good blood supply.

Age is another factor to be considered. Increased rapidity of healing, which is characteristic of younger

(Continued on page 35)

Dear Alumni:

We are really very modest—

but it is no use denying that we are very pleased with, and slightly proud of, the way you have received the QUARTERLY. Your letters have been unanimously complimentary, your comments heart-warming. We thank you.

Especially do we derive deep satisfaction from supplying to you who are in the armed forces the measure of diversion and enjoyment that you have told us the QUARTERLY brings you. We intend to get the QUARTERLY to you, wherever you are, if it is at all possible, and whether or not you are active subscribers. Thus, we may feel that we are helping you, in a very slight way, to do the grand job that you are doing, at and behind the fronts.

BUT the QUARTERLY cannot be published with good wishes alone. We ask those others of you, who are fulfilling the equally important task of maintaining civilian health, to support this publication so that it may continue to bring you and our graduates in the services into closer touch with the School and each other.

Sincerely,

The Editor

I hereby enclose (a check for) $..... (1 year's subscription, $3.00)
(2 year's subscription, $5.00)

Dr.....Class of.....

.....

.....

ARMY MEDICINE IN CHICAGO

By Bernard Shulman

Photographs by the U. S. Army Signal Corps.

Medical and dental care for servicemen stationed in large cities creates a special problem for the U. S. Army Medical Corps. These men do not live in camps and are consequently not under the direct supervision of a medical officer. In Chicago, such medical service is provided by the U. S. Army Dispensary, 604th Service Unit, which occupies the entire 36th floor of the Civic Opera House at 20 North Wacker Drive.

In addition to caring for servicemen stationed in the Chicago area, the dispensary furnishes medical aid to dependents of servicemen in this area, to civilian personnel engaged in War Department work, and to transient Army and Navy men who require emergency first aid and treatment. The dispensary concerns itself with all types of medical problems in these cases, and continues treatment until the soldier is ready for duty, or until he is sent to either his own medical officer (as in the case of transient servicemen), or to a general army hospital (such as Gardner) for further treatment.

Medical service is available 24 hours a day. The Red Cross, the police, and other organizations have instructions to send all emergency cases involving servicemen directly to the dispensary. The staff includes eight physicians, six dentists and five nurses, as well as pharmacists and other essential dispensary workers.

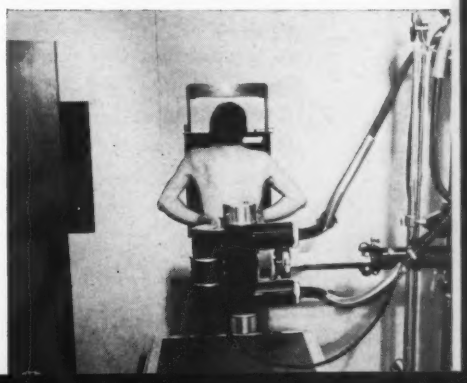
The dispensary is not merely a product of the war. It was in existence several years before Pearl Harbor, but it is much busier now than when first established. As a peacetime institution it carried on the same functions it does now. At present, the dispensary averages about a thousand patients a week, most of them in uniform. Not all its work consists of emergency cases, however, for it also provides for care in conditions which, though not chronic, take a short while for treatment. Emergency house calls are also made by members of the staff.

Major Harvey E. Gaynes, M.C., is the commanding officer at the dispensary. In explaining the type of

Reading clockwise ● *Reception room* ● *Prophylactic injection is administrated by Regular Army nurse.* ● *Blood pressure is checked by Army doctor in one of the examining rooms.* ● *Physical therapy* ● *A young dependent being examined* ● *Roentgenogram being taken of soldier's chest.*

work done there, he emphasizes particularly the fact that army medicine has a different purpose than civilian medicine. He cites as an example, the civilian with a cardiac condition who remains under the constant surveillance of his doctor as long as the condition persists. The Army, on the other hand, is concerned only with making men fit for duty, or rehabbilitating for civilian life those persons no longer capable of army duty. For this reason, the dispensary does not handle chronic cases, even among civilian dependents of army personnel.

The dispensary plan has greatly simplified treatment of Army and Navy men in large cities. It insures safe and rapid handling of emergency cases, with a minimum of red tape. Such dispensaries are located in key cities throughout the country, and are doing an excellent job in supplementing the work done by the Medical Corps in army camps and hospitals.



Alumni News

1916—We wish to thank J. M. Ramirez for his generous interest and hope that he will have continued success in his practice. Dr. Ramirez is specializing in chronic diseases in Cheyenne, Wyoming.

1927—Molly O. Robertson is a physician at Peoria State Hospital, Peoria, Illinois.

1934—Our thanks to I. Mirikitani for his encouraging remarks about the Quarterly. Dr. Mirikitani is practicing internal medicine in Springfield, Illinois.

1935—We are pleased to hear that Jacque R. Chalfin is busily engaged in general private practice, industrial surgery, and defense plant work in Venice, Illinois. He is a member of several medical societies, including the American Association of Railway Surgeons, the American Association of Industrial Physicians and Surgeons, and the Wabash Surgical Society. Dr. Chalfin is also District Surgeon for several railroad and street car lines and is on the staff of St. Elizabeth's Hospital at Granite City, Illinois. We are proud that Dr. Chalfin is doing such fine work, and we should like to send him our best wishes.

Solomon Sherwin Gersten of Rockford, Illinois writes that he has two daughters, aged five and two.

Captain Louis I. Greenspon received his captaincy September 12, 1943. Capt. Greenspon is in active service overseas. All communications should be addressed to 256th Qm. Bn., A.P.O. 957, c/o Postmaster, San Francisco, California.

Our regards to V. M. Timn of Metropolitan, Illinois. He is busy as a physician and surgeon.

1936—Captain Isidore Brill writes us that he is with the Air Transport Command. His address is A.P.O. 605, c/o Postmaster, Miami, Florida.

Capt, Joseph Fireman is stationed in North Africa, and since joining the army has been married. While in North Africa Capt. Fireman has met Lts. Alex Berman and Leo Frigo, also alumni.

W. J. Poshataske is doing surgery in Silsbee, Texas. He is a partner in the Silsbee Clinic.

It has been brought to our notice that Elmer H. Schnicke is with the armed forces in North Africa. Lt. Schnicke's address is 533 C.A. Bn., A.P.O 758 c/o Postmaster, N. Y., N. Y.

1937—Capt. Fausto Ciulini's name was seen recently in the newspapers in connection with the Italian campaign. The captain, who, before receiving his commission in September, 1942, had a general practice in Chicago, is at present second in command of the AMG in Naples. It was his duty, after the capture of the city by the Americans, to oversee measures to restore the health of the population to normal. Despite the wholesale destruction that accompanied the German withdrawal, Capt. Ciulini found the health of the community "Pretty fair, considering . ."

Capt. Ciulini and his wife, Clarice, are expecting a child in December.

1938—Mario A. Accinno tells us that he has applied for a commission in the Navy. At the present time he is doing general and industrial surgery in Birmingham, Alabama.

1939—Peter Berman asks us for the Quarterly. Lt. Berman is stationed with the 65th Airdome Squadron in Ainsworth, Nebraska.

1940—Lieutenant Albert J. Bartolo writes us that he is stationed at Fort Slocum, New York.

Bohdan G. Giel is doing full time industrial surgery in Gary, Indiana.

Capt. Victor Lodato, Jr. is stationed in Alaska, and would enjoy corresponding with his former classmates. His address is Med. Sec. 2nd. Bn. 201st. Inf. A.P.O. 937, c/o Postmaster, Seattle Wash.

A. A. Palow is in general practice and industrial surgery in Kankakee, Illinois. Dr. Palow is interested in hearing about his classmates. We hope we shall be able to tell him as much about his colleagues as he wants to know.

1941—Lieutenant Herbert P. Swartz notifies us that he is in the 102nd Medical Training Batallion, Camp Robinson, Arkansas. He is teaching medical subjects.

Congratulations to Louis M. Esterman on receiving his lieutenant's commission. Lt. Esterman is now at the Medical Field Service School in Carlisle, Pennsylvania. Previously he was Resident in medicine and surgery at Manhattan General Hospital, N.Y.C.

1942—Irwin L. Greenspon is interning at the Evangelical Deaconess Hospital, Chicago, Illinois. Dr. Greenspon is waiting for his army commission.

ALUMNI IN SERVICE

The following alumni have recently joined the armed forces and have not been presented in our previous issues.

Lt. Dominic A. Palmisano, '23
Lt. Herman H. Secunda, '25
Lt. Abel R. Larrain, '26
Lt. M. M. Rackleff, '28
Lt. Peter Pavluk, '30
Lt. Russell G. Iseberg, '32
Lt. Gayle H. Laymon, '33
Lt. Vincent V. Mullen, '33
Lt. Carl F. H. Pfeiffer, '33
Lt. S. A. Hirchfield, '35
Lt. Richard D. Kearney, '35
Lt. Bernard Shapiro, '35
Lt. Charles B. Myers, '35
Capt. Irving S. Schipper,' 36
Lt. John M. Garnello, '36
Lt. A. Vernon Feldser, '37
Lt. Adolph R. Cinelis, '38
Lt. Gervaise P. Pallasch, '39
Lt. N. A. Thompson, '40
Lt. Edward J. Levine, '40
Capt. Nicholas F. Parise, '40
Lt. Albro C. Tobey, '40
Lt. Morris D. Bennin, '41
Lt. John G. Millas, '41
Lt. Frank J. Sabatino, '41
Lt. Leo D. Richey, '41
Lt. Benjamin Dubrow, '42
Lt. Adam A. Niec, '42
Lt. Joseph L. Palumbo, '42
Lt. Alexander M. Panio, '42
Lt. Frank Parisi, '42
Lt. Howard Sloan, '42
Lt. Seymour D. Wishnick, '42
Lt. Michael S. Farmans, '42
Lt. Harry M. Siegel, '42

PROMOTIONS

The following alumni have recently received promotions in our armed forces:

Capt. Edward Y. Ross, '36
Capt. A. L. Schiff, '38
Capt. Victor Lodato, Jr., '40
Capt. Louis I. Greenspon, '35
Capt. K. F. Kopov, '40
Capt. Herman H. Hill, '38
Capt. Joseph Fireman, '35

School Notes

A recent addition to the clinical facilities of the School is the Oak Forest Hospital in Oak Forest, Illinois. This hospital has 1,660 beds comprised of 1,075 beds for general cases, and 585 beds for tuberculosis cases. The Medical Director of the institution is Dr. Eugene J. Chesrow.

Tentative plans have been made to have each Third Year student (starting March, 1944) spend an entire quarter in residence at the hospital, during which time he will serve a rotating clerkship in the various fields of general medicine under the constant supervision of our staff. To insure the adequate preparation of Junior students entering this clerkship, an increase in didactic medicine taught during the sophomore year becomes necessary, and will be provided.

* * * *

Miss Marguerite E. Campbell, the School Librarian, has been commissioned by the Treasury Department to sell War Stamps during the forthcoming Fourth War Loan Drive. They may be purchased in the library during the regular hours.

Social Notes

Harry Permsley, of the Senior Class, married Miss Suzanne Stone, of Evanston, Illinois, on Christmas Day.

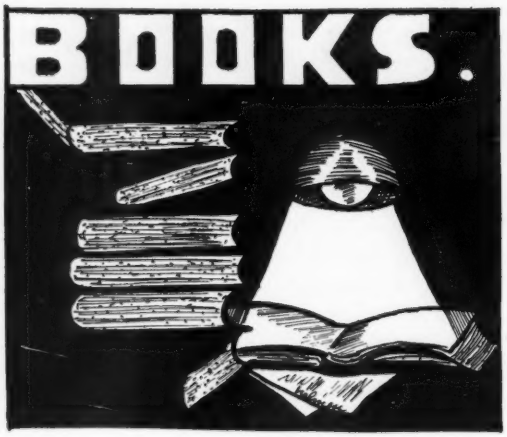
Philip Porter, a sophomore, chose New Year's Day for his marriage to Miss Lillian Zagel of Chicago.

Freshman Louis Polskin was married to Miss Frances Golub of Brooklyn, New York, on the 26th of December.

* * * *

AWARDS

The annual awards by the C. V. Mosby Company of one-year complimentary subscriptions of five of their medical journals to the "honor students" of the graduating class, as recommended by the Dean of the School, have gone to the following members of the March, 1943 class; Maximilian O. Goldsmith, LeRoy P. Levitt, Sam H. Rosen, Vivian Roth, Jerome S. Tobis.



CLINICAL DIAGNOSIS BY LABORATORY EXAMINATIONS: John A. Kolmer. D. Appleton-Century Co. New York, 1943. $8.00.

The effectiveness of the laboratory in helping the clinician to solve diagnostic problems is often minimized by the clinicians and over-emphasized by laboratorians. (I never saw that word before either, but its meaning should be obvious). In this book, Dr. Kolmer has tried to emphasize clinical interpretation rather than laboratory methods. The book is divided into three parts. The first is composed of twenty-one chapters and is devoted to interpreting the demonstrable changes in various tissues, fluids, exudates, transudates, excretions, secretions, etc. Essentially this is in the nature of a differential diagnosis of the various laboratory findings with an attempt at physiologic explanations of the phenomena described.

The second part of the book, composed of eleven chapters is concerned with a systematic division of the diseases of man, giving a short discussion of each group, and listing the various laboratory procedures that are indicated as an aid to diagnosis and the findings to be expected.

Not till the third and last part of the book, composed of nine chapters, does one encounter the technical methods necessary to the performance of laboratory tests. This is a relatively short section giving only the bare essentials of technic, which is to be expected since a good deal of the explanations usually incorporated in this subject matter in other books has been included in the first two sections.

Dr. Kolmer has written in his usual simple and straight-forward style. At the same time we must not lose sight of the fact that the subject is very complex and involves numerous fields of specialization. It seems to the reviewer that this volume should be of particular usefulness to medical students and physicians who are more interested in the practical utility of laboratory procedures rather than in the technical methodology.

Irving S. Neiman, PhD., M.D.

AMERICAN REVIEW OF SOVIET MEDICINE: Vol. 1, No. 1. October 1943. Issued bi-monthly by the American-Soviet Medical Society (for the Exchange of Medical Information). Dr. Henry E. Sigerist, Editor. Subscription $6.00 per year.

At last, the results and findings of a fast-growing and progressive Soviet medical science are being made available to the American public, and to American doctors and medical administrators. The purpose of this publication is to bring to American medical men translations of important Russian medical articles and publications which, because of the difficulties of translation, have been hitherto ignored. The magazine also contains surveys by American medical men of various aspects of Soviet medicine.

Dr. Walter B. Cannon, distinguished Harvard physiologist, who is president of the Society, states in his forward to this first edition of the AMERICAN REVIEW OF SOVIET MEDICINE, "Publication of the Review is one of the purposes of the American-Soviet Medical Society. The Society plans to send books and periodicals to the Soviet Union, and, when conditions permit, it plans to establish an exchange of students and teachers between the Soviet Union and the United States."

This publication promises to play an important role in supplying American medical men with information on Russian advances in medicine, and deserves close attention.

E. C.

* * * *

ALEXANDER POPE (1688-1744)

From his mother, Pope inherited his sick headaches; from his father his crooked spine. He could hardly stand upright unless laced into a stiff canvas bodice, and he had to wear a kind of fur doublet, so sensitive was he to cold. Yet the "long disease, his life" spurred on rather than daunted his keen intellect. Though there is an undertone of acid bitterness in much of his work, it is less than one would expect from one so hopelessly invalided.

Abstracts

J. C. Gant, R. J. Savignac, A. Hochwald, HISTAMINE BY MOUTH IN THE TREATMENT OF VASOMOTOR RHINITIS—The New England Journal of Medicine, 229: 579-582 (October 7, 1943)

Gant, Savignac and Hochwald used oral histamine in the treatment of vasomotor rhinitis. Most of the patients included in this series had failed to respond (often for years) to treatment with other methods. Thirty patients were treated as follows: The initial dose is one drop of a 1:1000 dilution of histamine in a glass of water. The patient is asked to observe the reaction closely. He finds that too large a dose aggravates his symptoms and too small a dose causes no change, but that the correct dose relieves him within ten or twenty minutes. If there are no bad effects, he is advised to increase the dose by adding one drop each day until toxic effects appear. Thereafter, he is maintained on the dose that is just below the toxic level, and this dose (which averages five to seven drops of the 1:1000 dilution) is repeated whenever necessary.

Within ten to twenty minutes, nasal obstruction, sneezing and watery discharge ceased. The benefit usually lasted for several hours, and sometimes a full day or more. Patients, who in the beginning, needed six or eight doses daily, after a few weeks of treatment needed only two or three doses daily, and later only occasional doses once every few days. The wide variation in patients' susceptibility to histamine constitutes the chief difficulty in the treatment.

The authors conclude that oral histamine therapy is definitely superior to other methods of treatment of vasomotor rhinitis.

A. E. Bennett, J. J. Keegan, C. B. Wilbur—PREFRONTAL LOBOTOMY IN CHRONIC SCHIZOPHRENIA—Journal of the American Medical Association, 123: 809-813 (November 27, 1943)

The authors review the literature concerning prefrontal lobotomy for certain psychoses and report their results in five cases. The patients chosen were all chronic, totally intractable schizophrenics. Apathy and inertia followed the operations. They had to be fed and moved about in bed, and they paid no attention to excretory functions. A daily postoperative routine was followed; bowels, bathing, dressing and feeding were forced upon the patients until responsibility developed. After some months, four of the five patients were able to assume adult responsibilities, as caring for money and making social adjustments which were impossible before surgery. Three to six months after surgery, return to former employment was usually possible. Such social recovery was attained in four cases of aggressive paranoid schizophrenia. One catatonic type failed to improve.

THE NATURE OF THE RENAL LESION WITH THE SULFONAMIDES AND ITS PREVENTION WITH UREA. Sidney S. Sobin, L. M Aronberg, H. C. Rolnick. Am. J. Path. 19, 211, 1943.

In an in vitro study it was found that the solubility of acetylsulfathiazole and acetylsulfapyridine, at a given pH, increased in proportion to the specific gravity of the urine. From experimental data and theoretical considerations it was believed that the factor responsible for this increase in solubility in more concentrated urines probably was an increasing amount of urea. The purpose of this investigation was to determine whether this same would also hold true in the animal body, and if it would, to differentiate between the primary nephrotoxic properties of these drugs and mechanical irritative effect resulting from their intrarenal precipitation.

In the experiments conducted, the investigators used a group of forty-eight adult white male rats and sodium acetylsulfapyridine. The rats were divided into four groups of twelve and treated as follows: groups 1 and 2 were each given 1mg. of sodium acetylsulfapyridine per gram of body weight, but in addition group 2 received 5 mg. of urea per gram of body weight. Groups 3 and 4 received 3 mg. of sodium acetylsulfapyridine per gram of body weight and group 4 received in addition 10 mg. of urea per gram of body weight. Untreated rats were used as controls.

Throughout the experiment, it was noted that the animals treated with sodium acetylsulfapyridine alone frequently presented a hematuria which was not constant from day to day. Hematuria was not observed in any of the animals receiving urea along with the sodium acetylsulfapyridine. The animals not receiving any urea often appeared ill and restless and ate poorly. This was not true of the urea group.

An interesting finding at autopsy was the finding of calculi in the kidneys of most of the animals not receiving urea, while those which were urea-treated showed no renal calculi.

The conclusions drawn by these investigators after

completing their study were that intrarenal foreign material following sulfonamide drug therapy is of two types: 1. precipitated sulfonamide and its acetylated products; 2. cellular debris, with calcium and iron deposition around or on this material. They also concluded that urea given simultaneously with sodium acetylsulfapyridine will prevent the precipitation of sulfonamides and the formation of renal calculi in rats. The action of urea is independent of a diuretic effect and depends upon a specific solvent effect on acetylsulfapyridine. The nephrotoxic properties of acetylsulfapyridine are mechanical in nature and result from precipitation of the drug in the renal tract. It was further concluded, from this investigation, that calcification in the kidney and the resultant calculus formation in sulfonamide-treated animals is dependent upon local tissue damage.

Simpson, Powers, Lehman: ACUTE INFECTIOUS JAUNDICE; United States Naval Medical Bulletin; Nov. '43.

This article refers mainly to those cases of obscure origin. The outstanding characteristics are similar to acute catharrhal jaundice. Clinically all evidence points to an infectious hepatitis. Epidemic jaundice has occurred frequently among troops of the United Nations in the mid-east during the present war. Yellow fever, leptospirosis were eliminated as causitive agent. In most instances the onset of the disease was marked by the sudden occurrence of a chilly sensation followed by a low grade fever, malaise, weakness and headache. Anorexia and abdominal pain were also noted. The urine became dark in color and the patient became yellow. The jaundice lasted for 2-4 weeks. Bradycardia was observed and the icterus indices ranged from 30-100 units. After recovery there was no evidence that the liver damage was permanent. The etiology of the condition remains obscure.

The treatment consists of a high carbohydrate and protein diet low in fat, reinforced when indicated by the parenteral administration of dextrose and plasma. There is also the liberal use of polyvitamin tablets.

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CORRECTION

On the editorial page of the October, 1943 issue of the *Quarterly*, the following statement appeared: "On one banner reads the legend, Faculty, 325, and on the other the legend, Alumni, 52." The figures in this sentence were reversed, there being at that time 52 members of the faculty and 325 alumni serving with the armed forces of the nation.

TROPICS

(Continued from page 5)

article about tropical medicine. The main question we are confronted with is: What shall one know who goes to the tropics as a physician? I always recall the words of the secretary of the Board of Missions of one of the biggest Protestant denominations: "The medical missionary shall be a specialist in the diseases of men, women, and children." The physician, hundreds of miles from the next hospital, laboratory, or specialist, is often asked to perform tasks one would never dare do in a civilized place. Perhaps the heat frees one of inhibitions as to his own capacity and knowledge, so that most attempts to perform extravagant operations have a happy ending. I met a laboratory technician who did an amputation of the arm of a wounded native. The patient lived and felt well; the technician also survived. Well, African native mothers used to bite off the umbilical cord after child-birth. What harm can a technician do? (Please, this is not a hostile attitude towards technicians—it is just a local reaction in my frontal gyrises after I saw the media sterilized to death this morning!)

Frankly, with all due serenity, the "tropical" physician shall know how to help his patients under peculiar conditions. But this is not a pre-requirement limited to hot countries alone. Years ago, I spent my vacation in Hungary, a country not tropical at all, except for the fata morgana in the prairies that reminds you of the desert. The local physician was gone. They called me at midnight to a gypsy woman with a neglected transversal position, fluids gone, uterus adherent to the dead fetus and all that stuff. After I had obtained reliquiae of the local doctor, I put the woman on a barrel, and had her husband hold a candle, and the midwife gave narcosis . . . The gypsy lady came the second day to my bungalow to thank me, and I am also here. By the way, the midwife put a pound of butter in the vagina before I arrived, so that the process would go on smoothly. The other "tropical" experience happened to me in the high Tatra mountains of my "old country." I ran down some scarlet fever streptococci in the valley, and then went to the mountains for a weekend, together with a dentist friend. Things happen, so we were summoned to an OB case. The dentist wanted me to do the tricks, but I declined because of my recent intimate friendship with Streptococci. He had to go to work, did a fine job, but surprised us all with his urgent and steadily repeated requests to the woman, when the head of the birth

came through the low passages: "Open your mouth wide! Wide open, please!"

Leaving fun aside, it would be advisable for every physician who wants to work in the tropics to spend some years in the backwoods. Dogpatch or Skunkhollow would be the proper place to learn to be self-reliant. Then, take a good course in tropical medicine—a really good one, no short-time instructions, and with as little laboratory help as possible! This may sound strange from the lips of a chronic, incurable and inextricable bacteriologist-parasitologist, but I believe in frankness. The lenses of your microscope will be covered with molds. Your methyl alcohol will evaporate from your Wright stain. Your iodine will be refused by the most amiable amebae in the world. Where are you then? It is better to learn to do as much as you can by physical examination and observation!

Then, prepare for rural work. There is no need for physicians in a colonial city, but you may help humanity when you go out in the country. Live as a white man has to live in the tropics, leaving some hundred feet between yourself and the natives, but do not live too far from them spiritually. Most native food may also be consumed without danger by the Westerner. It is not true that you have to import canned goods from America. The native hunter will bring you fresh meat regularly and you get many products of the soil which you let your own native cook prepare as you wish. Do not rely upon your interpreters, but learn the language of the locality. Insist upon cleanliness and honesty by your native houseworkers, and pay them well. Be careful in your contacts with other white people. It is easy to learn to drink in the tropics, mainly from the white men. Social life centers around churches, clubs or private homes. Make your choice, but do not aspire too high —e. g., to become a member of a British diplomatic club in Palestine. You will be accepted in a very friendly fashion by Latin people, and you will have considerable fun with them when you understand their humor.

Frankly, I do not believe that many of the graduates of our school will choose the tropics as a place to open an office. Therefore, I am somewhat more concerned with the aspects of tropical diseases after this war, when Johnny Doughboy comes back from the Southern Seas bringing some of them with him.

It does not seem probable that diseases limited to the natives, such as leprosy or framboesia, would appear in the United States except in very rare instances. Tropical Ulcers and Leishmaniases will be healed mostly during the service in the Army or Navy. Acute infectious diseases will not be imported because of their short duration. There is no fear that nutritional disturbances would attack any member of the best fed army of all history. But nothing is easier in the tropics than to contract malaria and dysentery. Natives have also a high percentage of venereal diseases, but I do not believe that these could play any role in the American Army. Your main problem will be that of recurring malaria and dysentery. You will have to recognize these maladies and you will have to treat them. There are malaria-transmitting mosquitoes even in Illinois that could become vectors when they feed upon infected humans. The dysentery outbreak in Chicago some years ago gives us a hint that such epidemics are possible.

The U. S. Army and Navy will surely take good care of every case of disease and carrier status detected during service in the Armed Forces, but there is a possibility of relapses, and you will have to be on the look-out for them in order to apply effective treatment, and to protect the environment of the patient or carrier.

It is difficult to predict what the status of these diseases will be after the war. Remember the achievements in epidemic diseases during the World War I? We may expect that new drugs will be found and that new laboratory methods facilitating the diagnosis will be devised. Therefore it is somewhat difficult to make preparations now in such a way that we will still be up to date when the war is over.

Today, the detection of malaria and dysentery depends upon the examination of blood and stool specimens. No really effective method is known for the concentration of malaria parasites in blood; therefore, the thick and the thin smears, obtained after provocation such as hard walking, alternate cold and warm showers, or an adrenalin injection are used, and the blood picture studied for the diagnosis of malaria, in addition to some serological test. Our task is easier in the case of amebic dysentery: examination of recently passed stool for trophoziotes; concentration for cysts, and the very good serological test of Craig, help in many cases. The examinations, however, have to be repeated.

For the treatment of cases and carriers, the U. S. Army method is recommended.

It is possible that skin diseases, such as Tinea cruris, will be brought back from the tropics by many soldiers. When you recognize it, (and this is not difficult) resorcin - salicin ointments, and, in bad cases, chrysarobin will be helpful. When you decide to use

good old iodine, do not paint the scrotum with it until you provoke an eczema, as usually happens.

Finally, let us not forget that the deep Southern parts of the United States have many features of a subtropical climate. The physician working there should be familiar with tropical diseases. The practitioner in the South, however, is working under favorable conditions, has all the assistance of specialists, hospitals, and laboratories, and therefore, his erudition does not necessarily include the requirements of an all-round athlete in Aesculapius' field. He has to make the diagnosis of many diseases common to warm countries, but he can rely upon well-equipped and well-conducted laboratories. He has a powerful arsenal of effective drugs within the reach of his hands, (or better, within the range of his Postmaster) whereas in the tropics he has to give what happens to be in his stock.

Undoubtedly, the importance of tropical diseases is increasing. This importance has grown so that most medical schools have included a course in this branch of medicine in their curriculum, and you have the opportunity to get still another A, B, C, or less while in school. Isn't progress magnificent? And there is one more member on the faculty who is losing hair under the influence of such of your statements as: "There is a marine typhus fever . . ." "Malaria is conveyed by mosquitoes of the class of mites . . ." and "Cholera begins with dehydrogenation . . ." things no student used to worry about some years ago. Isn't education marvelous?

And when you are through the course, you promptly forget how much Atabrine should be given, but you will remember for a lifetime "Dhobie itch," "Tchuchugamuchi," "Soduku" and similar interesting words. Do not get desperate about it. You might use them. "Soduku" means "rat-bite fever" in Japanese. When you meet a Jap soldier in the jungle and promptly call him "Soduku" you do well and express yourself in an easily intelligible way. Isn't applied science great?

Talking about languages, I have to add a final personal note. I have often been accused of speaking several languages. This superstition is based upon my life and travel in several countries. I am slowly forgetting my mother tongue and I have not learned English as yet. Do not be misled by this article. Any resemblance contained herein to correct grammar is purely coincidental, and the author refuses all responsibility towards Webster and Shakespeare.

VIRUSES

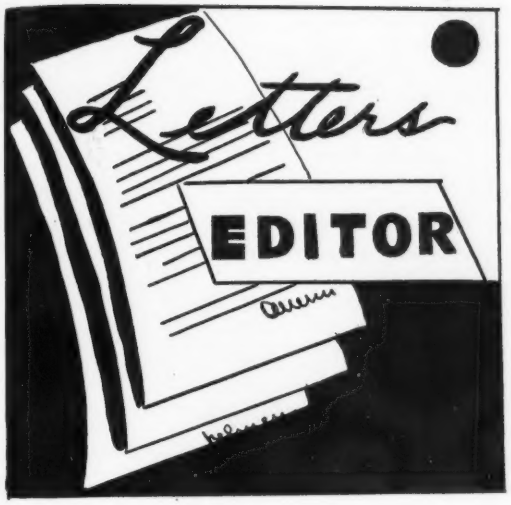
(Continued from page 15)

their source of energy. The sulfur bacteria also have this ability. The net result of this process is an increase in living substance, or growth and reproduction, at the expense of non-living substances, and with the absorption of radiant energy. This new living matter, then, has energy stored within it—potential energy—which would be released if the complex living material were to be again broken down into its simple, inorganic components. In the process of the transformation of carbon dioxide, water and minerals into protoplasm, the formation of various intermediate compounds having different energy levels occurs, and these syntheses are activated by various metabolic enzymes. It is the presence of these intracellular oxidation—reduction enzymes—catalysts really—that permits the conversion of simple, low-energy, inanimate substances into complex, high-energy, living matter, *if the necessary energy is available*. This *is* the basic mechanism of growth and reproduction, and is the only true criterion for life. Whatever other devices are developed to make this process more adapted to the environment are important but incidental.

All green plants have the ability, or in other words, the necessary metabolic enzymes, to start with inorganic substances and radiant energy, and build protoplasm therefrom. Certain bacteria, the *autotrophic bacteria,* do the same thing, but use the energy of the oxidation of simple inorganic compounds instead of sunlight. All of the organisms so far mentioned can carry on the life-processes independently of other living matter. Animals, in general, and saprophytic plants, of which yeasts and many bacteria are examples, do not have an enzyme system that can cope with such elementary material, and they require more complex, organic, high-energy substances that have already been synthesized by living protoplasm. These organisms are thus dependent upon green plants for their nutrition, although sometimes indirectly through other organisms or their products.

The intracellular enzyme system of an animal or bacterial cell usually requires that the raw material upon which it starts be of a certain complexity, but if it is too complex it must be broken down into intermediate substances which still have a high energy level. This process is known as digestion, and is usually accomplished by extracellular enzymes secreted by the cell or cells. This enables the organism to build up its own type of protoplasm from that of other or-

(Continued on page 37)



To the Editor:

Just a line to let you know that I find the *Quarterly* useful, stimulating, and informative.

To many of us, I suppose, it is the only source of contact with the dear old alma mater, and on that point alone it fills a long-wished-for need.

At present, I am with the Medical Detachment of the 252nd Field Artillery Battalion at Fort Benning.

Sincerely,
Herbert Tashman, '39
Captain.

To the Editor:

I enjoyed the October issue of the *Quarterly* very much. Keep up the good work.

After spending three months at the City Hospital in Utica, N. Y., I am now completing my internship for the next nine months at the Israel Zion Hospital in Brooklyn. The maternity unit here ranks third in the U. S.

Incidentally, I was married to the former Miss Sylvia Zaret of Brooklyn, N. Y., and am expecting a son in due time.

S. S. Bendet, '43

To the Editor:

After chasing me around for some time, by not having the correct address, your *Quarterly* (June issue) finally caught up with me. Needless to say, I was very happy to receive it. It enlightened me as to where some of my former classmates and friends are at present.

As you will notice, I am stationed overseas, and have been since January '43. I am on the surgical staff at the 221st Station Hospital, and enjoy my work very much, receiving invaluable experience.

I am writing you in order that you get my correct address and continue sending me subsequent copies of the journal. It is greatly appreciated, especially during idle hours.

You may extend my best regards to all my friends, and may I add that letters are greatly appreciated.

Sincerely,
K. F. Kapov, '40
Captain, M. C.

To the Editor:

I have just received the July issue of the Quarterly down here under the equator, somewhere in Australia. I enjoyed reading the publication, especially the article "Enigma of the Sane" by Burton Rockliff. Excellent, Rockliff—there are as many Lt. Lobins down here and all over the world as there are organisms on my son Ivan's hands after his mud-pie undertakings.

Following my graduation in 1936 and succeeding internship, I enjoyed three years of private practice in Cabery, Illinois. One year of Army medicine and surgery has taught me the *Army* way of being a country practitioner in an olive-drab suit of clothing bearing the mudstains of near-front-line foxholes.

Appreciate your sending me the Quarterly. It's well worth reading.

Sincerely,
Capt. Edward Y. Ross,
5th Cavalry, Reg., APO 201,
c/o Postmaster, San Francisco, Cal.

Besides his other discoveries, Galen also demonstrated that the recurrent laryngeal nerve was the nerve of the voice. He traced this nerve to the brain, thus proving that the mind reposed in the brain.

"Galen's Writing and Influences Inspiring Them" was the marrow of the vertebral column. It was Galen who showed that the spinal cord was a continuation of the brain into the spinal canal.

But even the best make mistakes. Galen maintained that the nerves traced to muscles broke up upon entering the muscle, but emerged again as the tendon, and was attached to the bone, so that in contraction, it was the nerve that contracted. He believed that the apparent contraction of the body of the muscle was only the slack produced by the actual contraction of the nerve in the tendon.

Faculty Notes

Dr. David M. Cohen, Assistant Professor of Dermatology, recently passed the American Board of Dermatology.

Dr. W. E. MacFarland, Associate Professor of Neuroanatomy, spoke at a Neurological Seminar at Northwestern University Medical School on December 1st. His subject was "Experimental Studies in Adrenal Innervation." The other speaker on the program was Dr. A. J. Harris of the Department of Anatomy, Northwestern University Medical School.

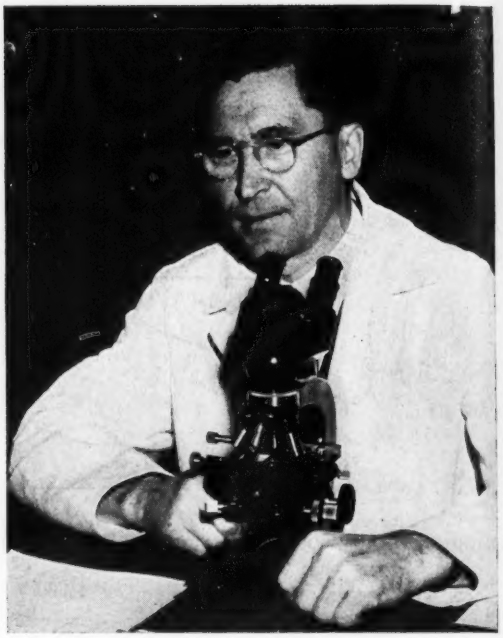
Major Don Miller, a former Associate Professor of Orthopedics at the School, writes from England that he is stationed at a British-made hospital of 800 beds, and is kept busy. He has equipped himself with a bicycle, and spends most of his leisure time touring the country.

PROMOTIONS

Several changes have been made in the status of faculty members during the past quarter. Dr. William MacFarland is now Associate Professor of Neuroanatomy, while Dr. Irving S. Neiman has been made Associate Professor of Bacteriology and Preventative Medicine. Dr. Jay A. Smith is now Assistant Professor of Physiology and Pharmacology, and Dr. Oscar Felsenfeld holds a similar position in Bacteriology and Parasitology. Miss Bessie G. Osgood has been promoted to Instructor in Physiological Chemistry, and Miss Viola Mae Young is an Instructor in Bacteriology and Parasitology.

NEW FACULTY MEMBERS

Dr. J. M. Essenberg has joined the faculty of Chicago Medical School as Professor of Microanatomy. Coincident with his new appointment Dr. Essenberg completed thirty years of medical teaching. He received his undergraduate training at the University of Valparaiso, and later served there as Assistant Professor of Biology for five years. Dr. Essenberg attended medical college for three years at the University of Oklahoma and Rush Medical College. He received his Ph.D. degree at the University of Chicago. Dr. Essenberg held the position of Assistant Professor in Microanatomy at the University of Missouri, and assisted in Gross Anatomy at the University of Oklahoma for a period of six years. Before coming to Chicago Medical School he was Associate Professor in Microanatomy at Loyola Medical College for 14 years. In the field of embryology Dr. Essenberg has done a great deal of research on sex determination and differentiation and the origin of germ cells. His chief hobby is plant and animal life, especially the study of fungi.



DR. J. M. ESSENBERG

* * * *

Lieutenant-Colonel Lester S. Johnson, M.C. is the newly appointed Associate Professor of Military Medicine.

His career is undoubtedly one of the most interesting and varied of any army officer. He is a long-time veteran of army service and started as a line officer, as well as having been an instructor in chemical warfare, gunnery, military sanitation and engineering. He also was a lecturer in the 33rd division on Military orientation. Following his service in World War I, he was graduated from the Loyola Medical School, where he later became an instructor in military medicine. Colonel Johnson has also graduated from the School of Staff Command. In the present war, Colonel Johnson has been incapacitated for active service, and has been retired with the rank of Lieutenant-Colonel.

Lt. Col. Lester Johnson

Colonel Johnson has many military publications to his credit. He is a member of the state medical societies, as well as the Association of Military Engineers and the Association of Military Surgeons.

We are indeed proud in welcoming Colonel Johnson to our staff.

* * * *

Dr. Robert M. Laemle comes to the School as Assistant Professor of Pathology, and with an envious background in obstetrics, gynecology, and pathology. He was born in Marshfield, Wisconsin, and after graduating from high school there, he entered the University of Wisconsin where he completed his undergraduate studies. He received his M.D. from Rush Medical School, and served an interneship and residency in pathology at Michael Reese Hospital. This was followed by an interneship and residency in obstetrics and gynecology. Dr. Laemle went into private practice in 1936, specializing in gynecology and obstetrics, but in 1940 he returned to pathology as assistant to Dr. Otto Saphir at Michael Reese Hospital.

Dr. Laemle has contributed several papers and publications dealing with gynecology and obstetric pathology. He has been Attending Physician at the Chicago Maternity Center and Adjunct to the Mandel Clinic Staff at the Michael Reese Hospital, and is now Pathologist at the Municipal Contagious Disease Hospital. He has held teaching positions since 1937 at Rush Medical School and the University of Illinois Medical School in obstetrics and pathology respectively. We are more than pleased that he has now joined the Faculty of our school.

Dr. Robert M. Laemle

Dr. Laemle married the former Miss Lucille Ebers of Beardstown, Illinois, in February, 1942.

We deeply regret to announce that shortly after this issue went to press, on December 30, 1943, Dr. Robert Laemle died of a heart attack. Although Dr. Laemle had been with us for only three short months, his character was such that his departure leaves us with a sense of real loss. His good humor, fair-mindedness, and eagerness to help made him as well-liked as his knowledge and abilities made him respected. The Sophomore Class, the only group he taught at our school, attended his funeral *en masse*, a tribute to his popularity with his students.

Organizations

A.I.M.S.

The Association of Internes and Medical Students has limited its activities, during the past quarter, to a program devoted entirely to moving picture films dealing with surgery.

The films ranged in scope from Ochsner's new technique for performing an appendectomy to Mayer's rapid perineorrhaphy. Some of the intermediate films included radical rib resections. lobectomies, and kidney resections.

During the coming quarter, the A.I.M.S. will continue this surgery program, but will expand the agenda to include a complete obstetrical series, beginning with prenatal care and ending with the postpartum care of both baby and mother. Speakers from one of Chicago's outstanding lying-in hospitals will discuss the films during their presentation, and will conduct an informal symposium afterwards.

The Program Committee has been busy booking speakers to address the A.I.M.S. on various subjects related to the practice of medicine, and such addresses are intended to be alternated with meetings devoted to films.

PHI LAMBDA KAPPA

This past quarter has seen considerable activity by the Alpha Rho chapter of the Phi Lambda Kappa fraternity. The initiation of new members, the departure of seniors, and several dinner meetings comprised the bulk of these activities.

After the usual pledge period, twenty-one men were initiated. They are: Leo Asher, Stanley Beckerman, Charles Biren, Louis Cholden, Murray Feldman, Elmer Fisherman, Allan Geller, Allan Hoffman, Edward Jaffe, Sidney Malitz, Marvin Morrel, Eugene Plous, Louis Polskin, Paul Prager, Jerry Rabinowitz, Bernard Reizner, Eugene Rosenfeld, Murray Silverstein, Harold Snitkoff, Lester Wolff, and Milton Wohl.

Towards the end of the quarter, elections were held for new officers for the coming year. Those elected were: Sam Udell, Superior; Jerome Goldflies, Chancellor; Max Linderman, Guardian of the Exchequer; Allan Baver, Scribe; Louis Polskin, Alumni Scribe; Lester Wolff, Sergeant-at-Arms.

The last dinner meeting of the quarter was held in conjunction with the Alpha Alpha chapter at the Illinois Student Union. An enlightening talk by Dr. Wayne Slaughter, Professor of Surgery at Loyola Medical School, on "Plastic Surgery and Congenital Anomalies of the Face" highlighted the evening.

The year's activities were climaxed with the Annual Dinner Dance on December 4th, held jointly with the chapter at the University of Illinois at the Hotel Sherman. Guests of the evening included Dr. and Mrs. John J. Sheinin, Dr. and Mrs. Jacob Brodsky, and Dr. Harry Epstein of Pitsburgh, the Grand Scribe of the national organization.

Plans for the coming year are being formulated by the various committees, and the high tempo of activity shown in the past quarter is expected to be maintained.

* * * *

GLANDS

(Continued from page 12)

the gall bladder and associated ducts.

Of course, it may be that the neurofibrillae are submicroscopic in their finer ramifications but, in animals as big as the cat and dog, they shouldn't become so small until practically to their destination. We have traced them to their terminations in the adrenal medulla of the cat and dog—but not in the rat. The anatomical approach—the physiological likewise—has been far from independently trustworthy. Clark ('33) made an extensive histological study of many tissues and glands following bilateral sympathectomy (removal of ganglionated sympathetic chains) and found a surprising lack of alteration in the appearance of any organ. This included the adrenal medulla and other structures known to be innervated. The explanation is not yet forthcoming unless one assumes regeneration or the presence of intrinsic ganglion cells sufficient to maintain the chromaffine or other tissues.

In any event, results based upon correlated anatomical and physiological data are more reliable than those dependent solely on one or the other, and if the problem of functional innervation of glands and other viscera is to be solved, it must be done with combined methods.

It is probably impossible to make an overall rule upon which the classification of glands may be based with respect to their types of activation, but it does seem at present that all glands with a nerve supply arise embryologically from either the ectoderm or endoderm. That doesn't imply that all glands from these two germ layers must be innervated (i. e. the thyroid). The adrenal cortex is one of the few glands of strictly mesodermal origin and may thus logically be expected, according to the observation just mentioned, to lack a nerve supply.

The fact that glandular disorders have been treated with negligible success in many instances has been due in large part to ignorance of basic facts. Just as removal of a portion of the thyroid gland has been found very beneficial in relieving symptoms resulting from hypersecretion of that gland, so it would appear that resection of the nerve supply should bring the same result. The main flaw in this line of thought, as already indicated, is that the nerve supply apparently goes exclusively to the blood vessels. Inasmuch as the nerve fibers to the adrenal medulla are known to pass chiefly through the greater splanchnic nerves, there would seem to be some justification for cutting those nerves in individuals suffering from hypertension. Actually, however, there are apparently too many factors involved in the growth of a state of hypertension to be relieved by merely cutting off some nerves which liberate adrenalin into the blood stream. Of course, as we now know, hypertrophy of the adrenal cortex, such as occurred in Cannon's experimental hyperthyroidism, or such as occurs as the result of infections and other harmful influences, could not and should not be treated by cutting adrenal nerves. Grafting nerves to a hyposecretory cortex (such as would occur in Addison's disease) would also be futile.

Surgery on the autonomic nervous system has progressed to the stage where it can be applied intelligently, but so far, the main success lies in the relief of intractable visceral pain (see White and Smithwick, 1941, The Autonomic Nervous System). Treatment of glandular function through the nervous system has not been marked by conspicuous success and it is the purpose of this paper to indicate the reason for this failure. However, it is not the function of this writing to debunk all attempts at glandular therapy through the nerve supply. Even in glands under humoral control, there would appear to be some hope for controlling the rate of secretion through the nerves which supply the blood vessels of that gland. But the chief hope lies in those glands in which the secretory process is directly controlled by the nervous system. If, as cumulative evidence indicates, peptic ulcer results from sustained hyperactivity of the sympathetic nerve supply to the stomach, then cutting the gastric rami of the sympathetic would be of inestimable value to thousands of people so afflicted from the stress of our modern world. In other tissues such as muscle and epithelium proper, the nerve supply is reasonably well understood, but in glandular epithelium we have gone on the assumption that nerves were present, though unseen. It seems more reasonable to find out which glands do and which do not have a nerve supply; then, in cases of dysfunction, the likelihood of proper therapy is greatly enhanced.

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SOLDIER

(Continued from page 10)

alarm clock gone berserk, may, even amongst veterans, paralyze will or stampede an army. Fear may also unleash the primitive in man, making him egotistic, cruel, or ferocious. Hysteria, panic, and other aberations having their genesis in fear may be antidoted by unmasking whatever causes the fear. The army cannot make men out of misfits or the unstable, so potential shellshockers should be ruled out of the fight. Most psychoneurotic cases ante-date their army service wherein they crack under stress, cumber action, and later burden the pension list.

Character is a priceless military asset. In the army, as elsewhere, it embodies virtue, but, to the soldier, significance is added by stern denial of self and resistance to circumstances which detract from personal or moral worth. The army method is positive and direct. It expects and demands. There is unconcern about the person, intolerance of the unfit, and ridicule for the peculiar. Adaptation to its life must be both pragmatic and philosophic, for its rigid circumstance will not be altered to meet individual needs.

Conscious mind, as the arbiter of behavior, acts by reason and will on the level of its ability to understand and form conclusions from circumstance or situation. The subconscious mind, always alive and a sort of instinct, accounts for all psychic phenomena outside of will and reason. In dreams and the hypnotic state the sub-conscious mind is alone working, but if through any psychic cause the conscious mind be suppressed, then the sub-conscious takes over and we may do the most unreasonable things in response to suggestion.

The soldier on the firing line has his attention so intently fixed on the enemy as to distract it from all else. The roar of battle, his limited vision, his constrained movement and action for considerable spaces of time, and the blank mind that always attends fear, fulfills a condition for receipt of suggestion. Thus we see how psychic suggestion may be rife on the firing line.

The conscious mind, through reason and will, obeys direct commands, while the sub-conscious mind, which may displace the conscious, reacts only to suggestion. To illustrate, take troops in a secondary attack. The men are in a state favorable to receiving suggestion. If the officer makes none, some coward's remark may

give the unfavorable suggestion that means panic. The officers must sense this psychic situation and give from time to time the plan of action with positive reiteration of how it will succeed. Then, at the time to advance, the order gives to each man psychically the suggestion, "Now we have them!" Under such conditions the attack will be carried out with spirit and determination.

Self-preservation, said to be the first law of nature, has its aegis over the soldier in the form of fear. Capitulation to fear is cowardice, while personal victory over fear is courage, which connotes bravery, valor, and fortitude. Self-reliance is the calm power and poise resulting from complete mastery of self, and familiarity with task and environment. It is essential to success in military life, and doubly important in the character of an officer, which military psychology considers of prime importance. Self-reliance in an officer inspires confidence and respect in his men, aside from acquiescence to his authority. Back of demeanor, position demands cognizance by the officer of individual, crowd, racial, and national psychology as a basis for human and psychic understanding.

When an officer commands on the firing line, he must realize that his men are a crowd and must be handled as such, not as the calm, respectful, obedient soldiers of the drill field. However, if discipline and training have established ingrained stimulus-response bonds of reaction, the officer will have automatic control over and be able to predict the action of his men within the range of probability. Troops may break the first day with a five per cent loss and the next fight to victory in spite of a forty per cent loss. Fatigue, or the lower psychic threshold of hunger, thirst, or sickness, is one explanation, and purely psychological conditions are another. Imitation is psychic compulsion and explains the influence of fashion. With action imminent, and in accord with this trait, the officer will be constrained to set the example, or fashion of behavior. In the zone of danger which surrounds and startles him, the soldier feels the need of assurance that the seemingly critical situation in which he finds himself is as it should be. Naturally he watches his officers, and if their quiet glances remind him that here, as in peace, the first duty is obedience, and if they advance fearlessly, he will not as a rule worry about the why or wherefore.

* * * *

If the spirit of a soldiery will not exhaust its last cartridge, and serve its guns to the last man, or if leadership yields to circumstance, then the fortunes of a nation will crumble. Patriotism and spirit are materials for unbreakable morale if leadership is equal to its opportunity. In practical estimates on war, the spiritual-material ratio is assumed at three to one. This value fluctuates, but, if lower, constitutes a psychological soft spot which may be exploited. Leadership, training, and equipment are a figurative tripod upon which the efficiency of an army rests. Leadership, though, is the more important, because it may have to forge out of immediate materials the means to victory. If there is a soft spot in leadership, then there is a soft spot for the enemy to exploit.

There is an admonition, "Lead, don't push men!" If the Command is all iron it fetters manhood. This becomes evident in glances of discontent, the facial stamp of unwillingness, or hate, or the body tenseness of emotion and suppressed desire which overtly precurse a spirit of rebellion, or what is worse—apathy. Yet, war needs iron will, and men will follow to the death a leader whose art contains, not only iron, but justice and appreciation as well. Shiny brass, polished leather, immaculate person, faultless equipment and function are not the whole story in a Review of Command, for the faces of men, not lips, tell infallibly of leadership and morale. A Command must possess soul to scale the heights of sacrifice, for war, in spite of its material aspect, is highly spiritual. What a Command writes on history's page is a reflection of how much this is appreciated beyond the integration and coordination of men and weapons in time and space.

MIGRAINE

(Continued from page 8)

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Norway sterilization law—"permits sterilization as a prophylactic of mental disease and of serious bodily ailment in the prospective progeny. The possible medical indications include neurasthenia . . . and such social conditions as unemployment and drunkenness on part of the husband." A word to the wise, gentlemen!

Personalities

Dr. William J. Reilly

A strong inclination towards incessant work, and an amazing ability to withstand huge doses of it, best characterize Dr. William J. Reilly, the Alumni Representative to the Board of Directors of The Chicago Medical School. Since the day of the completion of its construction in 1935, the doors of his office and hospital have never been locked, and service has never been lacking. Few men can claim such unceasing application to their profession.

Dr. Reilly was born on September 10, 1904 in Pittsburgh, Pennslyvania, and attended the University of Iowa for his undergraduate training. He graduated from The Chicago Medical School in 1923, and later took post-graduate work in eye, ear, nose, and throat conditions. During the following years, as a general practitioner, he attained a popularity in his neighborhood rarely encountered in urban practices. Even today, his neighbors come to him with their ills and pregnancies, and provide a considerable obstetrical practice. However, Dr. Reilly is kept busy mainly with industrial work, with emphasis upon traumatic surgery. He is company-surgeon for many of the largest plants in Chicago and for transportation lines. Dr. Calvert H. Lane is his office colleague in this work. Dr. Reilly has been in charge of several stations of the Chicago Welfare Society in the past. At present, he is on the Staff of the Holy Cross Hospital, and has been Field Health Officer for the Board of Health for the last sixteen years.

Dr. Reilly believes that experience in public health work and at social welfare institutions provides a firm foundation for the young doctor, and that opportunities to obtain such invaluable experience should not be ignored. He questions any other road to success in medicine than that of hard work and experience.

Dr. Reilly is a member of the state, county, and city medical societies, and belongs to the Phi Chi Medical Fraternity. He is married, and what little other interest there is left in his full life is given to cigars, botany, and gardening.

WOUND HEALING

(Continued from page 18)

individuals, was generally considered to be due to an increased rate of cellular proliferation. However, Howes and Harvey (1932), working on young rats, obtained results that indicated that healing in the young is more rapid than in adults because fibroplasia begins earlier and is less retarded, and not because of an increased rate.

The healing action of sunlight is due to its total spectrum, and not merely to the ultra-violet. The benefit is the result of direct stimulation to epithelization. Sunlight is the ideal radiant energy for wounds because it embodies not only ultra-violet radiation, but also the long-wave light and heat rays which penetrate deeply into the tissues. This has been confirmed by the work of Torraca (1921) and Laurens (1933).

As mentioned before, the condition of the wound, as far as sterility is concerned, plays an important part. A bacteriologically sterile wound, cleared of all blood clots and debris, and protected from outside contamination, will not heal. On the other hand, a slight bit of irritation, the introduction of a few staphylococci or small pieces of debris, all favor healing rather than retard it.

The effect of vitamins are still conflicting. At present, vitamin C seems to be the most important one concerned. Vorhaus (1938) states that a deficiency of ascorbic acid results in abnormalities of all intercellular substances having collagen as their basis, and that its absence prevents the formation of the matrices of white fibrous tissue, bone, and cartilage. The work of Lanman and Ingalls (1937) showed

similar results. Saitta (1930) and Lauber (1934) found conflicting results as far as vitamins A and B were concerned. The former claimed negative results with Vitamin A, but that a lack of Vitamin B greatly diminished the ability to cicatrize skin wounds in pigeons and rats. Lauber, on the other hand, found that oral administration of vitamin A resulted in a remarkable acceleration of healing—some lesions healing in 9 days, as compared to 18-25 days for controls. With Vitamin B no difference in healing time could be found. Very little work has been done on the other vitamins, so that accurate conclusions are not possible at the present time.

The influence of the endocrine glands on healing is still in the experimental stage. Most of the work has been done since the turn of the twentieth century, because until then the endocrine hormones had not been isolated. Lauber (1930, 1933) and Kosdoba (1934) found that the time of healing was reduced nearly 50% when extracts of the thyroid gland were placed on the wound surface. Kosdoba attributes the efficacy of thyroid to an influence on the connective tissue and blood vascular system, while at the same time he believes that the biochemistry of the wound contents is affected. All workers agree that total or partial ablation of the thyroid results in a definite retardation of healing.

Direct application of extract of the anterior pituitary accelerates healing somewhat during the first week, but does not shorten the total healing period (Ceccarelli, 1930). However, the injection of prolan by Lauber (1933) resulted in rapid healing of wounds. The gonads seemed to exert some sort of sex specificity, as the female hormone had a marked influence in hastening healing in the female, while it had little or no effect on the male. The male hormone is effective in both sexes, but mainly on application to wounds in the male.

The use of the X-ray in healing is becoming more and more prominent. The main difficulty seems to lie in the fact that the determination of the proper dose is difficult. Ritchie (1933) concluded that small doses stimulate the healing process, whereas larger doses produce a definite retardation. This was confirmed by Nathanson in 1934.

Bird and MacKay (1932) carried out a very striking series of experiments in which they investigated the effect of a deficiency of body fluid on the rate of healing of wounds. These experiments showed that, at least in the stomach wall of the rat, a loss of body fluid delays healing. This is probably due to the unfavorable circulatory and nutritional changes in the region of the wound. The mechanical factors which tend to decrease the quantity of oxygen and nutriment available for the chemical reactions of repair and tend to prevent the removal of fluid and substances from the region of the wound, are the decreased blood volume, peripheral vasconstriction with a decreased volume flow through the tissues, increased viscosity of the blood, and stagnation of the blood in the capillaries. Wounds which are undergoing normal healing have a pH 6.97—6.32 (Girgloff 1924; Haebler 1928), and acidity favors repair—i. e. dissociation of oxyhemoglobin is more complete, thus increasing both the availability of oxygen and the quick buffering of carbon dioxide on its return to the blood stream. Haden and Orr (1927) have shown a marked reduction in the oxygen content of venous blood in dogs dehydrated by means of high intestinal obstruction. This implies a suboxidation of tissues which can in turn result in a level of tissue acidity which is far above the optimum.

The mechanism and factors in wound healing are slowly but surely being brought into the open, but there are still many debatable points. The clinical significance of a more thorough knowledge of this process is obvious. However, at the present time, the clinician has a fairly extensive amount of experimental findings at his command to help him understand and treat the delayed healing of wounds.

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VIRUSES

(Continued from page 28)

ganisms, or from the products of other protoplasm. It also converts extremely complex substances into fractions that can pass through the membrane of the cell.

The organic compounds that are absorbed by a cell will meet one of two fates. Certain substances will be oxidized with an accompanying liberation of energy. This may or may not require the presence of oxygen, depending upon the type of oxidation-reduction enzymes present in the cell. The energy so liberated is partly given off as heat, partly manifested as movement, and partly used to convert other absorbed compounds into protoplasm with the aid of enzymes. Thus, whereas the green plant obtains its energy for growth from the sun, these organisms obtain it through oxidation of part of their food intake. The oxidative, destructive phase of metabolism resulting in heat production and movement is known as *catabolism*. The energy-absorbing, synthetic phase resulting in protoplasm formation is called *anabolism*. Since both of these processes occur concomitantly, the detection or measurement of metabolic activity can be accomplished by determining oxygen consumption, carbon dioxide production or heat liberation. The presence or absence of such activity is obviously an important factor in deciding whether certain matter is living or inanimate.

One peculiarity of the life-process is that the formation of living material is so controlled that the new tissue or organism has essentially the identical composition and characteristics of the mother substance. This control emanates from the nucleus, or more specifically from the so-called *genes* in the chromosomes. These structures influence the metabolic processes of the cell so that not only is new protoplasm formed in a consistent and specific manner, but new genes are also produced to control, in a similar manner, the protoplasm so constructed. It has been said that genes reproduce, but the truth of this depends upon our concept of reproduction. The genes, and there are hundreds of them in a cell, cannot reproduce outside of the cell, and their normal duplication is probably so dependent upon the metabolism of the cell that they can be thought of as being formed by the rest of the cell *under the influence of the parent genes*. Here, then, is a minute entity, protein in nature, which is able to not only govern the growth of protoplasm, but to cause protoplasm to contribute to the substance's own multiplication. As will be seen, the genes thus resemble viruses in certain respects, and will be again considered.

We have followed the increasing dependence of organisms upon other living matter from the green plants to saprophytic bacteria. We come now to organisms whose immediate environment must be another living organism. These are the *parasites*, and are important because of the detrimental effects their vital processes have upon their hosts, Man included. But physiologically, and for the purposes of this article, parasites show another important and interesting feature—a loss of function. As the parasitic organism long ago adapted itself to conditions in the host, certain life-processes were lost, the function being taken over by the host. Thus, the tapeworm has completely lost the ability to digest food, and the host must supply the enzymes for this process. Can we not say, then, that such organisms are *less alive* than their free-living relatives? For part of their life-process is carried out by the host.

Parasites may be divided into two types—*obligate* and *facultative*. The obligate parasites have probably completely lost certain metabolic activities, and can only grow and reproduce in a host that supplies the lacking function. The facultative parasites can live independently, but also find conditions in a living host very comfortable, and when they find themselves there they will thrive. For it must be remembered that many organic, high-energy substances are common to both living and non-living environments. In fact, almost all the obligate parasites might be considered facultative if culture media are taken into account. But culture media must be considered artificial imitations of the conditions found in the host to which the obligate parasite has become adapted. Thus, a blood parasite can be cultured upon a medium containing blood. In short, we can make the rule that any parasitic organism can be cultured *in vitro* if the factors that the organism finds necessary in the host are provided in the medium.

Certain exceptions should be taken into account at this point. Living organisms are sometimes able to adapt themselves to new conditions on very short notice. It is conceivable that the changed environment has an effect upon the genes, which in turn alter the metabolism of the cell. This variation would then last until the environment again changed. This phenomenon is often observed in bacteriological experiments and procedures, but need not be incompatible with our basic concept of parasitic life.

Where, now, do viruses fit in this picture of living organisms? It was W. M. Stanley's work, in 1935, on the tobacco mosaic virus that suggested the possible inanimate nature of viruses. The purification of the virus as a para-crystalline protein revealed the startling fact that one cu. cm. of a 1:10,000,000,000 solution was sufficient to infect a plant, with the subsequent production of large, demonstrable quantities of the virus in the plant. This virus has been further studied, and has been found to be 95% protein and 5% yeast nucleic acid, to be 330 mμ in length and 15 mμ in width, to have a molecular weight of forty million, and to be antigenic and inactivated by urea, formaldehyde and ultra-violet light. Some twenty other crystalline or amorphous materials have been prepared from various virus-diseased tissues. Some of these substances exhibit the qualities of true crystals. The tomato bushy stunt virus, for example, has been purified as a rhombic crystal, and analysis has shown it to consist of 83% protein and 17% nucleic acid.

But all viruses are not so simple. The composition of the elementary bodies of vaccinia has already been given. Rivers and R. F. Parker have not been able to demonstrate any metabolic activities of the elementary bodies of vaccinia. There have been some claims of finding metabolic activity in viruses growing in tissue culture, but the possibility of such results being due to an increased activity of the tissue cells caused by the presence of the virus cannot be ruled out. A metabolism of free viruses has never been demonstrated.

To state that viruses are inanimate on the basis of the characteristics of the tobacco mosaic virus and other plant viruses would be dogmatic and unjustified. Viruses vary widely in their properties, but are consistent in one respect. They are what we can call *intracellular parasites,* in contrast to the parasites previously discussed, which are normally extracellular. Furthermore, the viruses *absolutely require* the environment of a living cell to grow and reproduce. We thus see that the viruses are but a logical and final stage in an evolutionary, retrogressive trend to-

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wards increased dependency upon other living organisms, with an accompanying loss of function. Whereas the extracellular parasites have come to depend upon their hosts for certain nutrients and simple ferments, the viruses have invaded the very living substance of the host, and avail themselves of the metabolic enzyme systems within the cells.

The intruding virus, through long adaptation to intracellular conditions, has lost certain enzyme systems, just as other more familiar parasites have lost numerous abilities through long association with their hosts. The protoplasm of the parasitized cell provides the missing enzymes, as well as basic nutrient substances and energy. The number of enzymatic processes lost varies with different viruses, and, thus, the extent to which the cells of the host contribute to the multiplication of the viruses varies. The Rickettsia can be considered as the first step in the regression of bacteria to viruses. These organisms have probably lost only a few metabolic mechanisms, but this has made them sufficiently dependent upon living matter to prevent their cultivation *in vitro*. If our rule about the cultivation of organisms in artificial media holds true, the impossibility of ever growing Rickettsia or viruses upon lifeless media without supplying the necessary intracellular enzymes becomes apparent.

The viruses should be thought of as a series of organisms which show a progressive loss of metabolic function, and which depend upon specific types of cells to provide these functions. As more and more vital processes are abandoned, the organism loses more and more of the characteristics of life, which means that the ability of the organism to form non-living material into higher-energy living matter decreases. The ability to transfer the distinctive characteristics of the organism during reproduction, through the influence of the genes, is still maintained, however. If this retrogressive process is followed to its ultimate product, the result is a structure incapable of carrying on any metabolic activity, and consisting merely of heredity-determinants or, in other words, genes. The cell of the host would then supply all the metabolic enzymes necessary for the promulgation of the genetic substance. The simpler viruses may be just such a substance.

It must not be supposed that the host cell is doing all this work for the virus out of the goodness of its nucleus, if we may put it so. These genes, it will be remembered, not only control the the metabolism and growth of the protoplasm of the cell, but also influence the protoplasm to bring about the multiplication of the genes. When a virus is present in a

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cell, the protoplasm of that cell falls under the influence of the new genes, which are probably very similar to certain of its own. This influence results in the metabolic activity of the cell being partially directed to the reproduction of the virus, to the usual detriment of the cell. It is no wonder, then, that the chief microscopic pathology of tissues infected with viruses is intracellular inclusion bodies and degeneration.

The plant viruses that have been crystallized out as proteins are probably the simplest forms—large protein molecules similar to single genes. We see no reason why such viruses should not be considered inanimate. The theory that such substances are autocatalytic enzymes may not be far from wrong, but it is more likely that these viruses bring about a complex series of metabolic processes in the parasitized cell, resulting in the formation of new virus, rather than that they merely catalyze the production of themselves from a precursor protein substance within the cell. The more complex viruses having a variable number of enzyme systems may be considered living entities which require certain phases of the metabolism of living cells to grow and reproduce. Thus, the question of whether viruses are living or dead is one of degree.

There is also an apparent correlation between size and vitality. In organisms of such minuteness, a loss of function entails a loss of substance that is great in proportion to the total mass. Thus, none of the larger viruses have been crystallized, probably because they are more complex and alive than the smaller, protein, plant viruses. Also, the larger viruses behave more like living organisms in their antigenic action. Vaccinia, for example, has long been used successfully in the production of active immunization against smallpox, or variola. What the relationship between these two viruses is remains uncertain, but the presence in each of common antigenic substances producing a cross-immunity is a possible explanation. A heat-labile and a heat-stable antigen have been separated from vaccinia by Rivers, another indication of its highly organized structure. Supposedly attenuated vaccines of rabies virus, also a large virus, have been used for many years in the Pasteur treatment. However, a successful vaccine from the virus of poliomyelitis, which is only about 10 to 15 $m\mu$ in diameter, has never been prepared. Although the mechanism of immunity is poorly understood, it seems reasonable to assume that methods used for attenuating bacteria without destroying their antigenicity may not be applicable to the small, protein-like viruses. A completely new approach is indicated in producing active immunity against such viruses.

The similarity that has been drawn between certain viruses and the genes, and the explanation offered regarding the mechanism of the pathological changes in the cell caused by such gene-like viruses, leads to speculation upon the relationship of viruses to cancer. The common wart and Roux' fowl sarcoma have been found to be caused by a filterable agent. It is not difficult to understand how the presence of a foreign gene-like structure within a cell could cause wild, disorganized proliferation due to upset metabolism. In fact, it is almost surprising that this is not a more frequent result of virus infection. But the etiology of most cancerous conditions can probably be a number of factors, some of which are well-known, which cause a modification of the genes of the cells. An inherent instability of the genes might constitute the hereditary factor in the disease.

We have attempted, in this hypothesis on the nature of viruses, to relate the known facts about viruses to the characteristics of living forms in general. This concept of viruses has become, in a slightly different form, the most widely accepted view, because it is most compatible with experimental findings, it assigns the viruses a position in this world of living and nonliving things, and it explains the processes by which they got there. The fallacy of rigidly classifying any group of organisms whose nature is obscure according to a few possibly irrelevant characteristics has been demonstrated in the past, and is particularly to be avoided in differentiating viruses from other forms of life.

ARTHUR SCHOPENHAUER (1788-1860)

To the unhappy marriage of his parents, to his own unhappy amatory affairs can probably be attributed the misanthropy and eccentricities of Schopenhauer. A neurotic, he was beset by numerous phobias. He slept with loaded pistols at his bedside; he always carried a little leathern drinking cup and carefully locked away his pipes and cigar tips. He never trusted his neck to a barber's razor, going so far as to burn off his beard. Doubtless his neurosis had a decisive influence on his philosophy.

After Hippocrates' first contribution to physical diagnosis (characteristic facies, abnormality of fingernails, splashing sound in the thorax) twenty-one centuries elapsed until a major contribution to physical diagnosis was made by Auenbrugger's monograph on immediate percussion.